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Habitat of Grace

Biology, religion and the global
environmental crisis

A thesis
submitted in partial fulfilment
of the requirements for the Degree of
Doctor of Philosophy
at the University of Waikato
by

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The five Mission Statements of the Anglican
Church are:

First, to proclaim the good news of the Kingdom;

Second, to teach, baptise and nurture new believers;

Third, to respond to human need by loving service;

Fourth, to seek to transform the unjust structures of
society;

**Fifth, to strive to safeguard the integrity
of creation and sustain and renew the
life of the earth.**

ACC 8, 1990

ABSTRACT

The Fifth Mission Statement urges the Anglican Church to be, or become, involved in the world-wide effort by all thinking people, of any faith or none, to find workable ways to alleviate the global environmental crisis. As it stands, however, the Statement is an incompatible mixture of contemporary scientific and religious environmental concern set against a Biblical background that had no such concern. Therefore, public exhortations based on the Fifth Mission Statement taken at face value are unlikely to succeed, especially if addressed to secular audiences.

The environmental crisis is a *moral* issue, because it concerns the process of reaching communal decisions about the allocation between competing groups of common resources in short supply, such as finance for conservation, access to forests, fisheries, clean water, clean air, etc. The relevant context for understanding the moral dimensions of environmental protection must include contemporary biological and philosophical knowledge, because we need to understand what decisions are required, and the origin and nature of the ethical context of those decisions, as well as the reasons why so many people ignore the interests of the environment on which we all depend.

In this thesis I have explored some ways in which the insights of secular science can be incorporated into the Fifth Mission Statement, which will help Christians make a constructive contribution to the secular debate. From economics we can learn why the current free-market model is so subversive and why management of environmental common goods is so difficult; from game theory, why the personal restraint for which green activists plead is often not rational, except within the context of stable community life; from primatology, what are the evolutionary and social bases of morality and intelligence; from anthropology, how the combination of intelligence and socially-mediated morality as a conditional strategy has coaxed our primate and tribal human ancestors over time from rampant xenophobia through cautious trading of goods and ideas through to the philosophical analysis of true human ethics. The biological account of the origin and general operation of morality is very different from the theological and philosophical one, but is backed by a large and growing body of

empirical evidence. It must be considered by any moral exhortation intended, like the Fifth Mission Statement, to be credible to non-Christians. The Christian understanding of true altruism (charity) remains a matter that goes beyond biology and into the realms of grace.

An updated Christian theology of creation, and further development of the Fifth Mission Statement along these lines, will arm the Church to play a leading role in the environmental debate. Christian theologians should be among the very first to respond to E.O.Wilson's call for consilience between all branches of learning (Wilson 1998), since the unity of all knowledge is an ancient belief of the Church. Rational, passionate and updated Christianity could make a real contribution to developing some solution to the environmental crisis, to the extent that any solution is possible: otherwise, it will remain, as in the past, part of the problem.

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I have of course fully referenced all ideas that I have knowingly quoted from others, and my debt to them is huge, as the bibliography shows. Statements or concepts that are not referenced are mostly my own. But it is in the nature of life in the academic community that a casual conversation or a passing comment from someone else may lie dormant in the back of the mind for some time, and only much later emerge as what might appear to be one's own original concept. I would be unusual among scholars if that process has not also contributed to this work. To those unknown contributors, I also offer my thanks.

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PART I: SCIENCE, RELIGION AND ENVIRONMENT

1 PROLOGUE

1.1 Setting the scene

In 1990, the Worldwatch Institute in Washington estimated that humankind has about forty years to make the transition to “an environmentally stable society”. If we have not succeeded by then, it concluded, “environmental deterioration and economic decline are likely to be feeding on each other, pulling us into a downward spiral of social disintegration” (Brown, Flavin, and Postel 1990: 174). Worldwatch is no millenarian cult, but a sober and careful organisation whose annual summaries of world affairs have become the planet’s unofficial environmental health reports. Its pronouncements are cautiously worded, influential, and worth attending to, even if the timing is hard to predict. (“Things drag”, so, “if Worldwatch says forty years we probably have seventy”, says Randy Hayes, Rainforest Action Network, quoted by Athanasiou, 1996:60).

The potential contribution of the world's religious communities to dealing with the environmental crisis was made explicit by a group of 34 leading scientists, including the atheist cosmologist Carl Sagan and the Marxist palaeontologist S.J.Gould. In 1990 they signed an *Open Letter to the Religious Community* seeking to enlist the help of people of faith in addressing the environmental crisis. The letter points out that problems as huge as the contemporary threats to planetary health must be recognised as having “a religious as well as a scientific dimension....efforts to safeguard and cherish the environment need to be infused with a vision of the sacred” (Baker 1996, Rasmussen 1996:183). In 1992 came the *World's Scientists' Warning to Humanity*, signed by 1,575 distinguished scientists, including more than half of all living Nobel laureates (Ehrlich and Ehrlich 1996:242). All these authoritative voices agree that the survival of western civilisation will be at stake in the foreseeable future, certainly in the lifetimes of our children. Like the *Open Letter to the Religious Community*, the *World's Scientists' Warning* concluded with an appeal for help from the leaders of the global communities of businesses, industries and religions, yet the response so far has been minimal.

Various other watchdog organisations and influential voices such as Herman Daly, David Suzuki and the late Jacques Cousteau have called the 1990s the “crucial decade”, or “the turning point for human civilisation”. They all agree that we must realise what is happening and start doing something decisive if we want to avoid witnessing western civilisation sink into an uncontrollable decline (Athanasίου 1996:57). Or, “most of the great environmental struggles will either be won or lost in the 1990s. By the next century it will be too late” (Thomas Lovejoy, quoted by McDonagh 1994:145).

The data upon which predictions of future trouble rest are too diverse to be documented in full here, are not original to me and are (in outline at least) not in dispute. The argument to be presented takes them as read and proceeds on from there. As a reminder of the main facts, I here reproduce much of a succinct summary provided, with references, by (Jacobs 1996:15-17).

1. *Global climate change.* The scientific consensus on global climate change is represented by the findings of the Intergovernmental Panel on Climate Change (IPCC), comprising several hundred of the world's leading atmospheric scientists. The IPCC has confirmed the very strong probability that, as a result of emissions of greenhouse gases - particularly carbon dioxide, methane and CFCs - global mean temperatures will rise at a rate of around 0.3°C per decade - faster than at any time in the last 10,000 years. Mean temperatures are likely to rise by about 1°C by 2025 and 3°C by 2099. Sea levels will rise by about 65 cm by 2100. There has already been a noticeable rise in global temperature over the last few decades.
2. *Ozone depletion.* The release of CFCs into the upper atmosphere continues to deplete the ozone layer that normally shields earthly life from ultraviolet radiation. A “hole” in the ozone layer over the Antarctic has been documented every year since 1982, and in 1995 a similar “hole” appeared over the Arctic as well. The consequences are expected to include increased incidence of cataracts and skin cancers plus many so-far unknown effects on ecological systems. If all countries comply with their obligations under the 1987 Montreal Protocol (an international agreement to phase out the production and use of CFCs), the damaging trend could be arrested after about 1998, but full repair, if possible at all, cannot be expected before 2050.
3. *Deforestation.* During the 1980s alone, about 8% of the world's remaining tropical forest was lost, amounting to an area almost three times the size of France. The

1: Prologue

main causes, varying in different countries, are commercial logging, beef ranching and population resettlement. Tropical forests are home to many indigenous peoples and endangered species; they absorb CO₂ and so help to arrest the greenhouse effect; and they are the potentially sustainable source of many drugs and industrial products such as rubber, plant oils and resins.

4. *Biodiversity*. The continuing loss of global biodiversity, due mainly to habitat destruction (especially of tropical forest) and the translocation of species around the world by human agency, is now proceeding much faster than the “normal” natural rate (ie, the average for times other than during the mass extinctions triggered by large cosmic impacts). Projections from current trends suggest that between 1% and 11% of the world’s species will have become extinct every decade between 1975 and 2015. At present, about 12% of all mammalian species and about 11% of all bird species are listed as threatened, and a disproportionate number of the list of threatened birds are endemic to New Zealand.
5. *Fisheries*. The UN’s Food and Agriculture Organisation reports that catches exceed maximum sustainable*¹ yield in four of 17 important marine fisheries, so stock reductions must already be in progress. Catches are declining in a further six areas. Most other traditional fish stocks have reached “full exploitation”, meaning that intensified effort cannot increase the catch, and new technology aimed at doing so will inevitably induce reductions in these stocks as well.
6. *Water*. Scarcity of fresh water is already an increasing problem in 26 countries, home to 230 million people. “Water scarcity” is defined as annual supplies of <1000 m³ per person. By 2000, a third of the total population of Africa will live in water-scarce countries. Declining water tables, indicating unsustainable use, are now evident in parts of China, India, Mexico, western US, North Africa and the Middle East. Some 70% of the world’s drylands are suffering desertification, and about 1.5 million hectares of agricultural land are lost every year from salinisation. In most of Africa, per capita food production has been static or declining for the last decade even as population continues to increase.
7. *Acidification*. Pollution due to emissions of sulphur, nitrogen oxide and heavy metals is now affecting forests throughout the world. For example, acid rain affects 22% of European forests, and 14% of the land area of China (since China plans to increase the extraction of sulphur-rich coal by 35% this decade, the latter

¹ Words with asterisks are defined in the glossary.

total is bound to increase). Air and water pollution and the production of hazardous wastes are increasing rapidly in almost all industrialising countries.

8. *Pesticides*. Chemical fertilisers, irrigation and the development of high-yield crop varieties have increased agricultural productivity, but also made crops more vulnerable to attack by pests and consequently increased their dependency on regular use of pesticides. But pests quickly become resistant, setting up a “treadmill” of ever-increasing pesticide use, which itself creates serious problems for the health of humans and natural environments. In the 50 years since the regular use of pesticides became widespread, the percentage of crop loss due to pest damage has not measurably declined.

These and many more facts lay behind the sobering words of Boutros Boutros-Ghali, then Secretary-General of the UN, in his opening address to the UNCED* conference in Rio (June 1992): “The time of the finite world has come, in which we are under house arrest....Nature no longer exists in the classic sense of the term” (Granberg-Michaelson 1992:7).

People vary in their reactions to this litany of depressing data. Some become fearful and depressed; others take refuge in ignorance or escapism (such as, “There is no need to do anything, God is in charge of all history”). Furthermore, all these undoubted threats to the natural world are only the start of it: there are even more problems besieging the human social environment. Poverty, injustice and environmental degradation go together, since the poor almost always live in the worst environments. Exhortations by green activists to get people to vote on green issues tend to fall on deaf ears, or underline the feelings of helplessness among the sensitive. New Zealand developed the first green political party in the world (Values, established in 1972), but has not learned from its history; after 25 years there is still no clear green vision, and little on the political scene has changed (Rainbow 1993).

Apprehension among those prepared to think about what is going on leads rapidly to a sense of impotence. These forces of change seem to be so rapid and uncontrollable, so hugely threatening to both the natural and human worlds; and yet at the same time our political systems are simply not addressing them - as if politicians were not living in the real world (Jacobs 1996:2). Scientists are not much better: the majority of them ignore the *World's Scientists' Warning* and, instead of working hard to inform policy-makers and public of the technical and social

consequences of current demographic and ecological forecasts, continue to devote themselves to ever-more sophisticated analyses of trivial questions (Ehrlich 1997)

On the other hand, individual politicians and scientists are as caught up in indecision as anyone, because at root, what we call the “environmental crisis” is a sign of the whole cultural, and ultimately spiritual, failure of western society and its leaders. We all have to find a compromise between our personal convictions and the political and economic realities that govern us. None of us can live outside the prevailing social matrix – even the most committed environmentalists still fly around the world to meetings discussing what we might do about the environmental crisis which is in part accelerated by massive use of jet fuel (Oelschlaeger 1994:3) . The ultimate problem of the modern world, says Vaclav Havel, the Czech President, is “a lost integrity” (quoted by Rasmussen, 1996:17-19). We are all stuck together in the awkward space between a past we once trusted and a future we have not begun to understand. Yet the mainstream religions are generally seen as having nothing to say, as obsolete distractions (Rasmussen 1996:10).

1.2 Rationale

I embarked on this study in order to resolve a contradiction of which I have been aware for many years. If, for Christians, faith in a loving God is the ground of all meaning, as theologians assert and as I have found throughout a turbulent life, why does it have nothing to say about all this, the most urgent crisis of meaning in human history? Despite its ambiguities and chequered past, Christianity is a radically incarnational*, historical faith, anchored to the material world of time and space and insisting that creation and redemption are matters of direct, earthy experience in the present world as we know it (Houghton 1997). Of all the mainstream religions, surely Christianity ought to be able to say something useful about “lost integrity”, and to avoid isolating discussions of conservation or environmental problems from the related questions of social justice and of the advance of science, or from the great religious questions that undergird them all. But I was frustrated by the apparent lack of any sign, or at least any that was visible to me in my pew week after week, that any church leaders ever thought about the theological dimensions of these vital issues.

Part of this thesis was written during a year’s study leave which I spent at St Cross College, Oxford - the same College from which I had taken my doctorate in zoology

and immediately emigrated to New Zealand in 1971. Returning to the city after 25 years brought many poignant experiences, among which the most astonishing and the most disturbing was the regular sight of beggars in the street, which I had never seen in my student days. Walking the scant 100 m between College and the Theology Faculty Library was often an expensive business. I constantly struggled to reconcile the security, wealth and civility inside the colleges with the insecurity, poverty and degradation outside them; the immense gap now visible between the haves and the have-nots with my memories of British society in the 1960s; and the urge to follow the teachings of Christ about charity to the poor with the fact, or so I thought, that British taxpayers were already funding a welfare state supposed to meet the needs of the disadvantaged before they fell into undignified destitution on the street. Such encounters were as significant as regular lectures in making me think about the deeper questions underlying my thesis subject.

The international connections between beggars in an Oxford street and the economic and religious dimensions of conservation on New Zealand are neatly summarised by Ambler (1990:7-9) in his short, dense book *Global Theology*:

When so much of our life in the West is bound up with the hope of an ever-increasing expansion, how can we envisage life without it..... how can we believethat the civilisation that has given us modern science, democracy, individual rights and freedoms, and unparalleled wealth and leisure should be too unstable to last - and more than that, that it should be responsible for its own downfall?....what begins as a material crisis....becomes eventually a spiritual crisis....the material threats posed are directly or indirectly the result of our pursuit of material security. This paradox questions some of the deepest assumptions on which our lives are based....questions for which no answer can be found in modern science or in the practical wisdom of our future-oriented age....We must find a discourse in which we can communicate both our global concerns and our spiritual insights, our questions and our answers. We need something like global theology.

Theology may not be the best word: it has perhaps too many associations with abstract theorising and Christian apologetics.....[but] it is the only word we have for the job in hand, namely a serious intellectual enquiry into matters of spiritual concern. ***When theology is doing its job and not being diverted into defensive or abstruse argumentation, it is concerned with the central issues of the day and of human life itself...[and] with those***

responses to life in the past or today which seem to resolve the central problems of life through...confidence in the ultimate reality on which our life is based [my emphasis]. We can call those responses 'faith' as a kind of shorthand, but faith should then be distinguished from religious dogmas which may or may not give expression to faith. Theology could then be described as an attempt to understand the meaning of faith ..in different and changing circumstances. Global theology would be a search for the meaning of faith in our new global situation...If we hope to respond adequately to the present world crisis we need both to cross the boundaries of old religions and ideologies, and to dig deeply into the basic religious questions about human identity and security.

To anyone outside the Church, Ambler's view, that one can go directly from the environmental crisis as the problem to theology as the answer, may seem like a huge and unjustified leap in logic. The sort of theology that Ambler has in mind would have to find its place in a real world dominated by other systems of thought that do not, to put it mildly, regard theology as having anything vital to contribute. It is therefore necessary to examine Ambler's questions more closely in the light of recent advances in science* (especially ethology*, evolutionary psychology* and ecology), economics and politics, before attempting to put them into theological context.

Of course, that approach does not imply that theology must be judged in terms of science, or vice versa, although many are ready to take that view, eg Michael Cavanaugh (1996). It is the dialogue between them that might help, which in turn requires a deliberate broadening of vision – the opposite of the methodological reductionism typical of the scientific view taken alone. Science can only propose rational arguments about life; our duty is to consider their significance in the light of our non-rational experience of Christian sacramental spirituality. The field is very large, and I agree with Donald Campbell that the problem of trying to cover more than one specialised academic discipline is that the attempt, though necessary to gain a wider view, also requires an author to be "willing to be incompetent in a number of fields at once" (quoted by Ruse 1986: xiii). Becoming familiar with that risk throughout my work² proved to be the best possible preparation for appreciating the only book I have read that proves Campbell wrong, E.O.Wilson's *Consilience: the Unity of Knowledge* (1998).

² For an important note on the sources used, please see Appendix 1.

1.3 Some vital distinctions

1.3.1 Science and theology, technology and religion³

There are very many possible definitions of science, but they all involve concepts of speculation, experimentation, evidence, falsification, scepticism and constant revision under peer review. Because it is essentially practical and experimental, many people think of science as “organised common sense”. Somewhat fewer prefer to emphasise the provisional character of all theories by calling it “a series of successive approximations to the truth”. Almost everyone assumes that science is useful, reasonable, and closely related to technology, because it is supposed to be the basis of technological advance, or rather that technological advances depend on scientific understanding of the underlying processes. Hence “Science and Technology” are usually bracketed together, in Departmental titles, grant application procedures and ministerial portfolios.

Lewis Wolpert, in *The Unnatural Nature of Science* (1992), argues that the label “organised common sense” is properly applied only to technology, and that technology alone produces all the “useful” aspects of research - including almost everything that most of us think of as science, from computer engineering to clinical medicine. Science itself, Wolpert says, is a very different matter from technology. It is concerned with abstract speculations about the nature and behaviour of matter, and with fundamental explanations of the processes governing the material world. It is not itself directly useful, it is often counterintuitive, and is usually irrelevant to the short-term decisions of daily life. Technological advance does not need science defined in this sense, and indeed is regularly made with no understanding of the underlying processes at all - for example, natural selection has produced marvellous technology in animals without it, and cultural selection has done the same for every independent human society. The same principles behind most technological inventions of the twentieth century have been exploited by animals for millions of years (the jet engine by squids, the heat exchanger by arctic mammals, electricity by certain fish, hydraulic power by worms, and so on); early hominids made stone tools and spear throwers without any knowledge of lithology or physics; herbal remedies, the inventions of the wheel and the bicycle owe nothing to science; and cooking needs no understanding

³ The substance of this section was published as a note entitled “*Is Theology Useful?*” (King 1997).

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of chemistry. All these skills are developed by trial and error and cumulative natural or cultural selection, and handed down the generations.

By contrast, Wolpert pointed out, pure science requires a certain way of rigorous, often quantitative thinking that requires the *abandonment* of common sense and of its associated cultural authority. It takes an unusual person to be able to think as critically and freely as that, and such people are rare. One was Charles Darwin, who saw how the raw materials for evolution were supplied by the random variations which, though generally harmful to their owners, yet over the long term add up to precise, co-ordinated and beneficial adaptations. Darwin's insight is strongly counter-intuitive, and meets widespread incomprehension even today, despite the articulate explanations of many authors specifically aiming to combat this problem, such as Richard Dawkins in *Climbing Mount Improbable* (1996).

Not everyone would agree with Wolpert's definition of science. In *Taking Darwin Seriously*, Michael Ruse (1986) advocates a more evolutionary attitude to epistemology. He points out that scientific change is cumulative, as is evolution, though the analogy must be carefully qualified, since science is also directed and progressive as evolution is not. But in my opinion, they are both right. Wolpert's idea explains how individuals come up with original and insightful hypotheses (equivalent to mutations), while Ruse explains how the few hypotheses that survive the author's own self-criticism are then selected and developed by the scientific community.

There are as many different definitions of theology as there are of science. Theology was once known as "the queen of sciences", although few would grant it that title now. But if Wolpert is right, theology could be closely *analagous* to pure science. If science comprises abstract speculation about the nature of matter, as distinct from technology defined as the practical management of life in the material world, then theology comprises abstract speculation about the nature of God, as distinct from religion defined as the practical management of life in the social and spiritual world.

Wolpert's interpretations of the relationship between science and technology suggest several other possible parallels for the relationship between theology and religion. First, religion is an essentially practical matter, strongly influenced by cultural authority, and for the vast majority of religious people it is conducted without conscious reference to the theological concepts behind it. Just as cooks do not need to understand chemistry in order to produce a good dinner, a believer does not need to understand any of the various theories of atonement in order to find peace and

forgiveness in the sacrament of penance. In that respect, theology is no more directly useful to everyday life than pure science is, although of course both have profound hidden influence.

Second, Wolpert's claim that science is often counter-intuitive applies even more forcefully to theology. For example, the concept of unmerited grace is very difficult to grasp by human beings adapted to live in a society whose internal workings are governed largely by reciprocal altruism, which itself goes back to our simian ancestors (S.6.2.1). Current research in primatology is revealing the depth and influence of reciprocal altruism in our closest relatives, but also its flexibility and potential for community integration. In the light of our long evolutionary background, and on the assumption that human nature is at least partly explicable by it, we can all too easily understand why many people in the post-Christian world identify more with the prodigal son's older brother than with the prodigal himself, or more with the labourers who had worked in the vineyard since dawn than with those who came late but got the same wage. Both stories were told to convey a deep *theological* truth about the unconditional love of God, which sounded counter-intuitive and even offensive to the practical, common-sensical, *religious* people that first heard them. Likewise, people today still insist on keeping scores, despite centuries of Christian teaching. Most of Robert Farrar Capon's books, especially *The Parables of Grace* (1983) and *The Astonished Heart* (1996) are about why "hell is full of forgiven sinners" who could never bring themselves to accept the gift of life for nothing.

Third, really rigorous and independent thinking is very difficult, and few people are capable of it. In pure science it requires a particular mindset, and a disciplined pre-occupation with apparently useless questions. Prayer also requires a particular mindset, and is a difficult, disciplined and apparently useless activity.

Fourth, any scientist who does come up with an original idea subjects it to experimental testing against the real world and ultimately to the judgement of the scientific community. Hence it is claimed that science is objective in a sense that theology can never be. Theologians may well attribute a profoundly original insight, in themselves or others, to a divine revelation, but ultimately that does not allow them to escape the need to achieve congruence with the real world, or to submit to the judgement of the religious community. The contemporary rejection, especially since the rise of feminism, of traditional doctrines on human nature based on Augustinian interpretations of the Fall seems to me to be effectively a religious equivalent to an unfavourable referee's report in the peer-review processes of science. What Barbour

(1997:158) calls “intersubjective testing” of belief – the long process of filtering, confirming and publicly validating our individual and communal experience – is much slower and less rigorous in religious than in scientific communities, but it is there.

In short, science is not organised common sense, and neither is theology. They have much more in common than appears at first sight: both can be distinguished from their respective practical aspects, and both are in constant need of revision, even though that is never easy. Wolpert concludes that “Only a small amount of science is useful; the trouble is, *we don't know which bit*”⁴. In my view, the same applies to theology, and that parallel is at the same time the toughest challenge to, and the best hope for, the ancient traditions brought into question by the contemporary environmental crisis. Under these definitions, this thesis is mainly about the *religious aspects* of the environmental crisis and about the *visionary faith and leadership* that the Church must find in order to face it.

1.3.2 Faith, religion, and doctrine

The first distinction discussed above implies a second, between the personal faith of individual believers and the official structures, both material (buildings) and intellectual (doctrines) of their particular religious tradition. This thesis is concerned with mainstream science and mainstream religion, and especially but not only with Anglicanism. I think it is possible to be, like Barbour (1997: 98), loyal to both and yet critical of *both* the reductionist and materialist interpretations of many scientists *and* the irrational and exclusivist interpretations of many religious dogmas. When I realised the significance of this distinction, in about 1989, I developed an appropriately biological metaphor to explain its significance to this study.

The Church* is an extraordinary mixture of objective and subjective values, of matter and life, body and spirit, human and divine, religion and faith. All these are necessary before it can be fully itself. But they operate in different, overlapping domains of human experience. Challenges to deeply-held convictions belonging to one domain do not necessarily threaten the others. In the context of this thesis, it is very important to state clearly at the outset my conviction that it is possible to criticise religion and doctrine – and change them – without damaging the faith that underlies them. The argument can be best explained with a metaphor involving a familiar animal, a hermit crab.

⁴ Verbal comment made during a debate in Oxford in 1997.

Like a crab, the church has an external skeleton, a visible and objectively definable container for the animal within. Ask ten people to define a crab, and their descriptions will be similar enough to instruct an eleventh person on how to recognise a crab in a rock pool. But the essence of a crab, the life of it, its essential crabbiness, so to speak, is not in its shell but inside, an invisible power in the soft parts that makes them pulse with blood and buzz with nervous messages. Ask the same ten people to define what makes a live crab alive, and they will probably produce quite a variety of definitions of life, even if they are scientists⁵. Maybe the only common conclusion will be that a dead crab cast up on the beach is still recognisably a crab, but it does not function as one.

A church building is still objectively definable as a religious institution *sensu* Wolpert, even when it is empty, but it cannot be a functional church until it is brought to life by the faith of its people. Conversely, there are places where groups of individuals meeting in each other's private homes blossom with vigorous faith, while the congregations supporting conventional religious observance in glorious surroundings wither away. Religion without faith is as dead as a cast-up crab; it is only faith, with or without religion, that can give life, and that life does not depend on any particular external form.

Every individual crab is the temporary expression of the crab-life that it got from its parents and will pass on to its own offspring. The individual animals grow, breed and eventually die, but the genepool from which they came remains as alive, and as indefinable, as ever. The local population of crabs thrives for as long as their genes are passed in unbroken succession from one generation to the next. Moreover, the same properties of "aliveness" that animate a live crab also pulsate through a huge diversity of other animals, from bacteria to elephants, each according to its own species pattern. In the same way, the faith that makes a church alive is passed on from one member of a congregation to another, and so long as the succession remains unbroken the group remains a functional church despite changes in individual membership.

Faith and genes are alike in that they have to be passed on from one individual to the next by direct contact, and in both, a break in the chain can cause a local extinction. The actual form of the body containing the life is not important; what matters is that that body

⁵ For two alternative current technical definitions, see Maynard Smith and Szathmary (1995: 17-18). At the 1996 Star Island conference, Ursula Goodenough, President of IRAS* offered a third, layman's interpretation: "making something happen against the odds, and remembering how to do it".

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works as an expression of the life inside it. There are hundreds of different types of crabs, and just as many different places where faith does its healing work.

The shells of crabs offer considerable protection from predators, but they cannot be invulnerable. There is one group of crabs, the hermit crabs, that has found an extra form of protection: they back themselves into a discarded mollusc shell. They have long naked tails, and they use them to hold onto an empty snail shell of the right size by extending the tail around the inside spiral. At the end of the tail there is a special appendage, with which it can take a firm grip on the spiral (Fig 1.). Thereafter it can move about, carrying the shell around on its back like a snail with legs. The snag about crab life in general is that, as the crab grows, its exoskeleton gets too tight, so it has to moult and grow a bigger one. The double snag for a growing hermit crab is that it not only has to grow a new exoskeleton, but it also then has to find a new shell, which might be quite a different shape. The period between abandoning the old shell and finding a new one that fits is very dangerous, because that is when predators can catch the hermit crab with its vulnerable tail exposed.

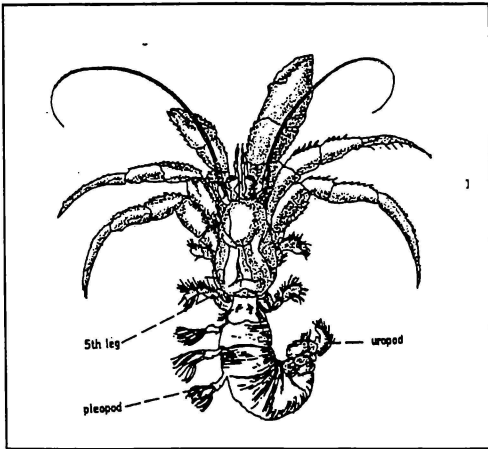
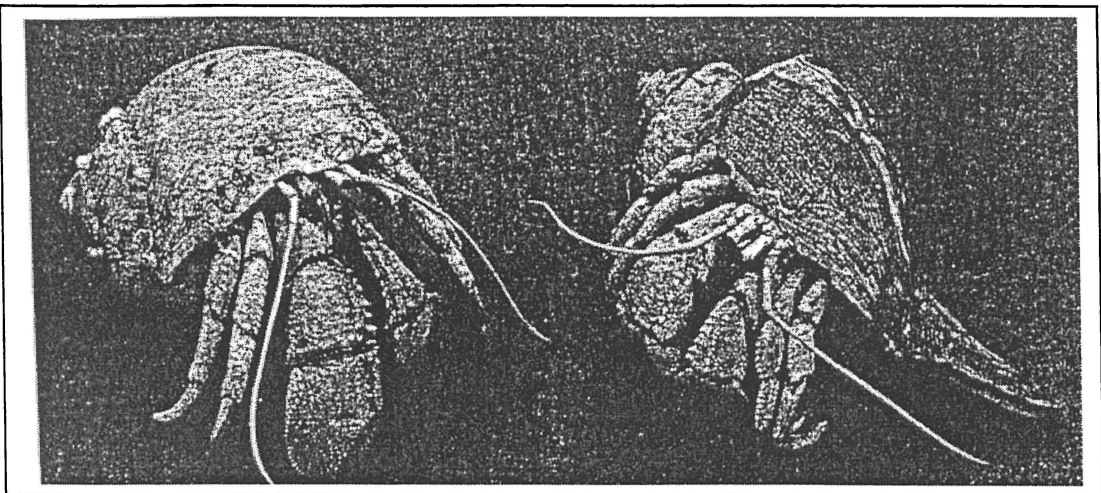


Fig.1 A typical hermit crab. (a) Out of its shell, showing the soft tail; (b) two crabs inside their shells, showing that shells of any shape are acceptable so long as the size is right (from Barnes 1963).

Christianity in general is rather like a hermit crab. Experientially-defined faith gives Christianity life,



which ultimately derives from the *kerygma*, the conviction that Jesus Christ is the Son of God and the saviour of the world. Christianity also has an exoskeleton, an objectively defined Church or other religious institution in which that life is temporarily organised. But the Church also has a soft tail, a point at which it is vulnerable to attack by its enemies in the outside world. To protect its tail, Christianity has developed over the years a mass of traditions and doctrine (the *didache*) which are designed to defend its own members from damage and to answer the critics. Church buildings were themselves designed as visible representations of the current *didache*, and have changed as its doctrines developed. For example, engravings in the catacombs emphasised personal devotion to Christ in the Eucharist, but after Constantine, church art began to show him seated on a heavenly throne. Doctrines, like shells, that are effective for the moment will not remain so indefinitely; live churches, like live crabs, cannot help growing out of them.

A hermit crab can live in a shell of various shapes so long as it is the right size. Likewise, faith can be expressed in various forms of *didache*, all equally valid provided they truthfully convey the central *kerygma* in a form that the current generation finds helpful. But just as a hermit crab is forced to move out of a shell that becomes unsuitable, faith that is driven out of a doctrine that is no longer tenable tends to turn up elsewhere.

The shell occupied by the catholic version of the Christian religion is particularly magnificent and has been growing for two thousand years, but it is now too heavy for the crab to move about in. Just as a species that was well adapted to a past environment may become endangered if that environment changes, so the post-Constantinian interpretation of the majesty of Christ is profoundly inappropriate for today's society. To me, the reason why the traditional churches have lost credibility in the contemporary world is not because the *kerygma* is no longer valid, but because its *didache* is no longer convincing - the crab is still alive but it needs a new shell, and quickly. Of course, it is during the period between shells that the crab is most vulnerable to attacks from outside; but the alternative is worse.

I am convinced that (1) it is possible to revise the *didache* without endangering the *kerygma*; and that (2) it is necessary to do this, so that – as envisaged by the Fifth Mission Statement - the Church can enter into a fruitful partnership with the secular authorities who are already tackling the environmental crisis. Without denying the organic connection between them, this thesis therefore makes a clear distinction between definable religious traditions and doctrine on the one hand, and experiential, indefinable, partly irrational (in the same sense that falling in love is irrational) faith and spirituality on the other.

Under these definitions, criticisms of, and suggested reinterpretations of doctrine are matters of rational judgement, and are not to be taken as criticisms of personal faith. Both are part of the religious experience, and there is ample evidence that deep religious commitment can be combined with critical reflection. The two pithiest summaries of this relationship are attributed to one authority from either side - a great saint, St Anselm ("theology is faith seeking understanding" :McGrath 1994:49) and a great scientist, Einstein ("science without religion is lame: religion without science is blind" : Wolpert 1992: 146-7). A recent survey confirmed that about 40% of practising scientists believe in a personal God and in life beyond death (Larson and Witham 1997) – about the same as in a previous survey taken in 1916.

1.4 Research Methodology

I have used the standard techniques of literature searching in academic libraries, at St John's College (Auckland), Theological Faculty (Oxford) and Waikato. I passed through the Education For Ministry programme, completing in June 1996.

I have attended five international science-and-religion conferences, in Dunedin (August 1993), Oxford (July 1996, January 1997), Star Island, New Hampshire (August 1996), and Berkeley, California (June 1998), specifically in order to discuss ideas with speakers and other participants. I have exchanged correspondence and drafts with several of the people I met at these conferences. In 1995 I visited several high-profile researchers and institutions prominent in the field: Center for Theology and the Natural Sciences (Berkeley), Chicago Center for Religion and Science; Ian Ramsey Centre, St Cross College, University of Oxford; and Fuller Seminary, Pasadena. At each place I sought interviews with appropriate scholars.

I spent a sabbatical year at St Cross College in 1996-7, working with Arthur Peacocke, a leading writer in the field. I attended lectures and seminars offered by the Theology Faculty and several relevant Departments and Colleges of the University of Oxford, and various other meetings organised by Church House in London (October 1996), the Science and Religion Forum/British Ecological Society at Hoddesdon (September 1996), and Christians in Science in Birmingham (October 1996).

I have consulted with various Church officials active in the field, personally at the headquarters of the Church of England in London and at the Waikato Diocese office in Hamilton, and by email with the World Council of Churches in Geneva.

In early 1998 I coordinated a team of Waikato lecturers in developing a proposal submitted to the John Templeton Foundation Science and Religion Course Awards. The proposal was successful, and the course will be offered in the Department of Religious Studies at Waikato in July 1999. Its syllabus was selected to be mounted on the Internet to represent the high standard of the work of the Templeton Foundation. The aims of certain sections of the course and of this thesis overlap.

1.5 Ways of approaching the contemporary dialogue between science and theology

Ordinary experience as a practising scientist soon shows that meaning and truth are culturally determined; that observations are never truly objective; and that all conclusions based on them, drawn from what one might hope is the unvarnished evidence of nature, are selective. Similar conclusions about the different sorts of meaning and truth conveyed by religious ritual are inevitable after a few decades of sitting in Anglican pews. A widely accepted fourfold classification of contemporary interactions between them is proposed by Barbour (1997).

Barbour's classification applies to science in general. In this work I refer mainly to biology, but with cross-connections to environmental ethics, politics and economics where necessary. I write as a biologist literate in Christian theology, aiming to explore the implications of my own discipline for the continuing development of Christian moral and practical theology. I avoid systematic and philosophical theology, as these terms are usually understood, except to point out some places where the integration of the biological viewpoint suggests useful new insights into ancient beliefs (Appendix 3). I use the term "religion" mainly in the Christian context, and "church", "Church" and "theology" as defined in the Glossary.

1.5.1 Conflict

The most common image of the relationship between science and religion is that of warfare or conflict, fuelled by many repetitions of old stories such as the confrontation

between Huxley and Wilberforce in Oxford (Lucas 1979), and in modern times relentlessly advocated by Richard Dawkins and Peter Atkins, among others. The Oxford meeting and other historical events have been misreported and exaggerated, and in any case the diversity of views on both sides was far greater than the popular image allows, but these facts have not prevented the growth of two opposite forms of the conflict model, scientific materialism and Biblical literalism (Barbour 1997: 77). The mistake made by both is to assume that evolutionary theory is inherently atheistic, and they thereby perpetuate the false dilemma that people have to *choose* between science and religion. Barbour points out (p. 84) that

the whole controversy reflects the shortcomings of fragmented and specialised higher education. The training of scientists seldom includes any exposure to the history and philosophy of science or any reflection on the relation of science to society, to ethics or to religious thought. On the other hand, the clergy has little familiarity with science and is hesitant to discuss controversial subjects in the pulpit.

Underlying this problem is the even deeper question of what counts as a valid explanation (Poole 1994). The urgent need for the modern Church to address the matter of science education is taken up again in S.12.3.

1.5.2 Independence

In their attempts to meet the challenge of science, defenders of traditional Christianity commonly argue that religion and science are compatible, because they are totally different. They do not compete because they address different questions - science explains how things are, religion explains why. Or, like Barth and his followers, they simply reject science altogether. But these are both unhelpful responses to the real challenge of science, and anyway they underestimate the capabilities, interests and aspirations of many scientists. Closer to the mark, and far less reassuring, is the totally opposite assertion of Appleyard (1992:83). He maintains that science and religion are completely *incompatible*, because

Science [is] the lethally dispassionate search for truth in the world whatever its meaning might be; religion [is] the passionate search for meaning whatever the truth might be.

It is true that academics are used to thinking of truth as relative, experiential and conditional, whereas many ordinary Christians find it difficult to let go of the concept of truth as absolute, revealed and eternal. The difference between these views is the basis of Appleyard's astute but somewhat cynical observation on the different priorities of religious people and scientists. Attempts to harmonise them without guidance lead quickly to cognitive dissonance. For those unwilling to reject one or the other, the only possible response is to keep science and religion in separate boxes, and so retain the benefits of both without conflict. Such is the experience of countless youngsters brought up in Christian homes today.

In real life, science is not as objective, nor religion as subjective, as writers such as Appleyard like to claim (Barbour 1997:93). The development of critical realism (S.1.6) makes it possible for members of both the scientific and religious communities to make cognitive claims about invisible realities. And we must do this, difficult as it may be, because as Barbour points out (1977:89), if God is confined to the realm of the self, the natural order is deprived of any religious significance except as the impersonal stage for the drama of human existence. More significantly in the present context, this attitude offers the Church no hope of making any contribution to the environmental debate. If religion deals with God, and science with nature, who can say anything about the relationship between God and nature? So it is possible to argue on other grounds that the independence model is no more helpful to the science-religion debate than is the conflict model.

1.5.3 Dialogue

A somewhat diverse range of views can be grouped under this heading, which portray the relationships between science and religion as more constructive than under the conflict or independence models but not close enough to be thought of as integration. Some point to philosophical questions that are raised by science but cannot be answered by it, such as the apparently unique origin of science in western culture (S.8.3), or the "fine-tuning" of the cosmological constants (listed by McGrath 1998). Some list the methodological parallels, one form of which I illustrate in S.1.3.1. Some explore various forms of nature-centred spirituality, such as those of Matthew Fox, Rupert Sheldrake and Brian Swimme. The latter are characteristically much more holistic than most forms of mainstream (reductionist) science. Because there is much to criticise in reductionist science, especially reductionist biology (S.6), their views are interesting; but from the point of view of the Fifth Mission Statement, Fox and

Sheldrake are too controversial to facilitate dialogue with most secular environmental agencies, so I have not considered them further here.

By far the most authoritative and most welcome participant in the dialogue is E.O.Wilson, himself usually regarded as one of the arch-reductionists. But his recent book *Consilience: The unity of knowledge* (Wilson 1998) is a modern treatise in the spirit of Thomas of Aquinas. Wilson and Aquinas both believe, for different reasons, that the world is orderly and potentially understandable in terms of a relatively few simple laws. Opposition to this view comes more often from the humanities than from the sciences, and Christian theologians can learn much from Wilson's reasoned responses to the vitriolic criticisms he has received from all sides. He is an atheist who leans "towards deism but consider[s] its proof largely a problem in astrophysics" (ibid p. 268). He concludes that religion will possess strength to the extent that it codifies and puts into enduring, poetic form the highest values of humanity consistent with empirical knowledge (p. 296).

1.5.4 Integration

Barbour (ibid p. 98) identifies three strands of thought under this heading. *Natural theology* discusses to what extent it is possible to infer the character of God from evidence of design in nature. The *theology of nature* asks what input science may have in reformulating traditional, prescientific doctrines about creation and about the nature of humanity. *Process theology* aims to construct a coherent world view, an inclusive conceptual scheme which can interpret all events within a single system of metaphysics.

For many leading voices in this debate (Ian Barbour, Charles Birch, John Cobb and others) the development of process theology offers more hope of integration between religion and science than does traditional church teaching. Mesle (1993:1) offers a simple definition: "'Process theology' is the name for an effort to make sense [ie, find truth and meaning], in the modern world, of the basic Christian faith that God is love...It requires that we rethink the nature of both God and the world". Process theology can be criticised as downplaying the sovereign activity of God, both in creation (McGrath 1998: 46) and in redemption (Berry 1995), and such comments are helpful warnings against jettisoning established truth along with outmoded interpretations. However, this thesis is written from the conviction that it must be possible to see both scientific and religious truth as contributing parts of a greater

whole, and that, however difficult and threatening the rethinking process may be, any progress we can make towards integrating them must surely help equip the Church to tackle the huge challenges raised by the Fifth Mission Statement.

1.6 Interpreting observations: models and paradigms in science and religion

Science and religion are both communal activities conducted under the pervasive but largely unconscious influence of a prevailing paradigm. Kuhn (1970) defined a paradigm as a cluster of conceptual, metaphysical and methodological presuppositions held in common by those involved in a particular tradition, by which they interpret all observations of the world about them. We humans in general cannot make any sense of a new observation unless we can place it into the context of that prevailing paradigm, which can suggest from past experience some theory about what it might be. So CS Lewis describes the reaction of his hero Ransom on arriving on a totally unknown planet:

he knew nothing yet well enough to see it: you cannot see things till you know roughly what they are (Lewis 1943).

Likewise, the first Aboriginals to see a sailing ship off their coast ignored it, as they had no idea what it was and no experience from which to guess the threat it presented to them (Willey 1979).

Observations of nature made in the days of the early Greek philosophers such as Aristotle were filtered through minds filled with contemporary theories about how the natural world worked. For example, Aristotle believed that the behaviour of every natural object was governed by its own nature - dogs bark, and rocks fall, because it is their nature and purpose to do so. He never did any of the controlled experiments that are the basis of modern science, because they could not answer the questions he was interested in: he did not see the point in interfering with the nature of the object being observed (Lindberg 1992: 53). The power of a ruling paradigm is well illustrated by the difficulty that modern scientists have in understanding Aristotle's view.

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Now our theories of nature are very different, and therefore the questions we ask of nature and our interpretations of what we see are also very different. The surprising thing is not that any of Aristotle's interpretations were wrong, but that so many were right. For example, Aristotle rejected the Platonic idea that the only true reality was to be found in eternal forms, of which the whole material world as observed by the senses - including all individual animals - are imperfect copies. Aristotle's experience of watching and dissecting animals led him to argue instead that individuals are real *in and of themselves*, and their imperfections are part of their own character, not their failure to be something else. On this point at least Aristotle sounds completely modern, and very relevant to our contemporary understanding of the key role of imperfections in the processes of evolution.

In both science and religion, the ruling paradigm defines what questions may fruitfully be asked, what models of abstract reality might be acceptable and what assumptions must be ruled out, how new data will be sought and interpreted, and how old data can be understood in new ways. An established paradigm is extremely resistant to falsification, since discrepancies can, for a long time, be set aside as anomalies or interpreted through various auxiliary hypotheses which are much more easily modified than the central core theory (Murphy 1990). If the strain on the current interpretation becomes too great, there will be a sudden "paradigm shift", during which some people suddenly "see" the arguments from another point of view, and completely change their understanding of the matter. According to Hans Küng (1990), every major discontinuity in church history has been marked by a paradigm shift.

Where there is a choice between competing paradigms, the decision on which one to accept is personal and philosophical, since there are no objective rules to help. Hence, every paradigm shift in church history has left behind a group continuing to uphold the old ideas, and many of these have survived to the present day. In normal science such choices are rare, although I will argue in S.6.6 that recent work in primatology is now offering us two competing options on how to interpret the origins of human morality. On the wider scale, the conflict model (S.1.5.1) sees science and religion as offering competing paradigms by which the ordinary person may find meaning in life.

Therefore, all data in science are theory-laden, and all experience in religion is concept-laden – there are no theory-free data and no uninterpreted experiences. The social and evolutionary experience of being human has long ago established unconscious preferences that influence what new knowledge we can take in.

Together these constitute "epigenetic rules" (Wilson 1998) or "hermeneutical pre-knowledge" (Cavanaugh 1996: 250), which in turn determines what new explanations or proposals might be acceptable. So how do we answer Pilate's perceptive question, "what is truth?". Barbour (1997:109) lists three answers developed in western thought.

First, truth is *correspondence with reality*. This is an acceptable definition for common-sense situations, but fails at the door of any Wolperian research projects, or theological propositions, requiring the abandonment of common sense. Unfortunately, several concepts fundamental to the Fifth Mission Statement appear quite contrary to common sense, eg that people in western democracies should vote for policies that would reduce their standard of living (S.4.2).

Second, a proposition is true if it is *comprehensive and internally coherent*. This criterion serves well until it meets another, competing but equally internally cohesive idea – such as during the argument over whether the universe was centred on the earth or on the sun. This thesis will offer examples of smaller-scale but similar meetings (S.6.6), since reality as we perceive it in nature and in the divine seems to be a lot more paradoxical and less logical than rationalists like to think.

Third, the pragmatic view is that a proposition is true if *it works in practice* – if it unifies disparate observations, and is fruitful in predicting new observations or finding solutions to puzzles. Barbour comments that the *meaning* of truth must be ultimate correspondence with reality, but since reality is often inaccessible to us, the *criteria* of truth must include all the above, taken together and welded into the system of thought advocated by Barbour (1997: 118) and Peacocke (1995) and others, known as *critical realism**.

The basic assumption of critical realism in both science and theology is that *existence* precedes *theorising*. Both disciplines develop by the continual extension of the models that help us to visualise the invisible realities that surround us. Good models are metaphorical but not purely imaginary, since pre-existing realities always set limits to our speculations. They are neither rigidly defined nor merely temporary and dispensable, but fruitful and open-ended sources of ideas for cumulative modifications and extensions. The more we learn, the more we can adjust our models; contrariwise, models that are not adjusted to take account of new knowledge rapidly become irrelevant.

1: Prologue

Influential individuals in both disciplines tend to become wedded to their models and equate modifications with personal criticism. This may impose humanly understandable but irritating delays in progress, but they cannot last for ever – as the saying goes, “funeral by funeral, science advances”. The same applies to doctrinal developments, especially in the Roman Catholic Church. Therefore, a substantial part of this thesis is devoted to examining what advances might be made in Christian ideas about creation and human responsibility for it from current developments in evolutionary biology.

2 DEFINITION, HISTORY AND IMPACT OF THE FIFTH MISSION STATEMENT

2.1 Introduction

For Christians, there are three different aspects to the environmental crisis, all worrying. First is the challenge to our beliefs. There have been many attempts to understand the full implications of natural science for traditional theology, not all equally fruitful (Barbour 1997:97). We do not have to deny the value and enduring truth of many older traditions (Morton 1989: 24), but at the same time we do have to allow for the fact that the relevant sciences (anthropology, evolutionary biology, ecology) are fast-moving international disciplines, and we must participate in the current debates, however scary they may appear. Christians have constantly to resist the temptation to “domesticate” the debate, because, says John Reader,

It is far easier and safer to try to contain the challenge of ‘green’ theology within existing boundaries than to be open to the possibility that what it really requires is a complete re-think of traditional Christian attitudes.most of the material that has been published so far has gone for the safe option, that of reinterpreting our existing language..... what is needed is something new and as yet undeveloped. If Christians are to share in that process of development they will need to.....be prepared to let go of ideas from the past that are no longer adequate (in Ball et al. 1992:4).

Other contemporary theologians agree: ‘What is needed now’, says Ruth Page, in *God and the Web of Creation*, ‘is not another skirmish on the green fringes of belief but a rethinking of fundamental doctrine’ (Page 1996).

Second is the challenge to our comfortable life-styles. Although the probable consequences of the environmental crisis are well publicised in the western world, and the statistics get more alarming every year, few people are willing to face the unpleasant fact that, sometime quite soon, it will no longer be possible to carry on with our lives on the assumption that the future will be a more or less logical extrapolation of the present. Profound life-style changes, especially in Northern*

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countries (the places where such changes will have the greatest ecological impact), are highly unpopular (McFague 1993:3), and so are not talked about. The necessary task, adds McFague (ibid:17), is to get people to see that it is not enough merely to change our life-styles; we must change what we value, and that will be even more difficult.

Third is the perceived (but illusory) conflict between the demands of the poor and of nature. Left-leaning activists tend to be suspicious that attention to environmental concerns will divert scarce resources away from the more immediate issues of poverty and hunger (Hallman 1994), or that environmentalism is a luxury of affluent Northern societies:

The exploitation of nature and the exploitation of other human beings are inseparable; they reflect a common set of cultural values and a common framework of economic and political institutions.....Despite the significant legislation it has produced, the conservation movement has been limited in its long-run effects because it has tended to think of nature and man apart from this social context. Its victories are at best stop-gaps in the face of the population explosion and burgeoning industrial pollution. The movement has often been supported by relatively privileged groups, people who could afford hunting and fishing or vacations in National Parks. Conservationists have usually assumed that no fundamental changes in our society are needed. Like John Muir in the last century, they have often scorned the city and instead have urged escape from society and its problems into the beauty of the wilderness (Barbour 1972:159-60).

There is resentment that the Northern nations, having ruined their own environments, now want to hamper development in the South so as to protect their own life-styles. So people still ask whether money spent on environmental protection would be better diverted to social programmes (Daly and Cobb 1990:377), or, picking up Barbour's point, they see conservation as a hobby for the wealthy, since only those who had money could afford to worry about dolphins (Granberg-Michaelson 1992:9). But McFague's description of nature as "the new poor" (McFague 1993:166) neatly underlines the link between environmental and social concerns. Christians do not have to make a choice between caring for the poor and valuing the natural world as the handiwork (however interpreted) of God; both duties are done together when we challenge the ruling economic paradigm (S.4).

2.2 Ecumenical background

The first and basic requirement for the health of the *oikoumene*, the whole inhabited earth, is that it be habitable (Rasmussen 1996:91). “Habitat” or “household” is the core meaning of all three “eco” words - ecology, economy, and ecumenism, and all three meanings meet in the wider implications of the Fifth Mission Statement. So it is entirely appropriate that the first glimmerings of interest in ecological matters as a legitimate concern of the church can be dated to an address given by Joseph Sittler to an ecumenical organisation, the World Council of Churches (WCC) in New Delhi in 1961 (Williamson 1992:93). He pointed out that, ever since Augustine, Western Christendom has been unable to connect the realm of grace with the realm of nature. The universally accepted Greek idea of a dualistic split between the spiritual and the temporal necessarily meant that redemption has had to be visualised as an escape from the cosmos of natural and historical fact.

However, this attitude is isolated between, and inconsistent with, both the Biblical concepts that preceded it and the modern, secular European ideas that have followed it. For the Hebrews, creation was to be understood as the scene of God's sovereign activity, not a prison of evil to be escaped (Simkins 1994). And to modern ears the Augustinian formulation is untrue to the organic character of Biblical language, and unintelligible in the present state of human knowledge and experience. Rather, in modern times we can again insist that the natural world is not simply “the stage on which the larger drama of history is played, but has a key role in that drama itself ” (Michaelson 1994:98).

WCC was founded in 1947, with a largely Protestant background and leadership (Gerle 1995). The attitude to environmental matters of the relevant WCC sub-unit, Church and Society, until New Delhi and also for the next twenty years after it, remained one of low-key, pragmatic instrumentalism. A programme emphasising the Christian vision of a Just, Participatory and Sustainable Society (JPSS) was established in 1975, in response to a warning from Charles Birch to the Nairobi Assembly that, in ecological terms, the world is a *Titanic* pursuing its collision course with the iceberg (Williamson 1992:93). Although the concept of sustainability is rooted in the Biblical idea of order in creation (Rasmussen 1996:161), JPSS did not include any idea of protecting creation for its own sake.

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That all changed at the Vancouver Assembly in 1983, after Jürgen Moltmann pointed out that the long-established interest of the churches in peace and justice for humans was not enough by itself: there can be no peace and justice for us unless we also protect the natural world. The delegates therefore resolved to call for a new global conciliar process to be established, to covenant for Justice, Peace and the Integrity of Creation (JPIC). Their specific rejection of the previous concept of sustainability in favour of the somewhat woollier and unfamiliar one of “the integrity of creation*” was “greeted with dismay” by WCC at the time (Gosling 1992:7). But by then the churches in Germany and parts of Scandinavia and Canada had become heavily involved in environmental issues, and the Pacific churches had long been suffering the effects of nuclear testing. Between them they shocked the Vancouver delegates into a re-evaluation of the entire ecumenical agenda. Hence, although secular concern about nature conservation is by no means new, and research on it is considerably more advanced outside the churches than within them, Vancouver made the unique contribution of declaring that justice, peace and the integrity of creation are to be seen as inescapably linked.

The response to the Vancouver initiative by local churches was delayed while WCC made continued efforts (until late 1987) to get active participation from the Roman Catholic Church⁶. The negotiations failed, largely because the RCC and the WCC had different ideas of what was meant by a conciliar process. The RCC thought of it as a “top-down” one, exclusively run by and for the church hierarchy*, whereas the WCC insisted on a “bottom-up” approach including many lay people (Niles 1992). Considering the gravity of the issues at stake, McDonagh (himself a Roman Catholic) justifiably calls this a lame excuse (McDonagh 1994:106).

When JPIC eventually got into gear, the reaction of churches around the world varied according to the current local concerns of each region. For example, the primary concern in the Pacific was the question of anti-nuclear protests; in Africa and Latin America, the unbearable burden of foreign debt; and in southern Africa, apartheid (Gerle 1995:55). At the first Conference of European Churches, held at Basel in 1989, ancient antagonisms were fading, but only because more urgent problems

⁶ The Roman Catholic Church was not involved in WCC’s earlier assemblies: for example, it refused to co-sponsor the important World Congress at Seoul in 1990, and took up only 20 of the 50 observer seats allocated to it, although it has since done many parallel studies of its own (McDonagh 1994:106).

were rising, to do with the new ecumenical environment. The meeting brought together almost 700 delegates from 120 member churches of the Conference of European Churches, and the 25 Bishops' Conferences of the Council of European Bishops' Conferences. It was the first occasion on which representatives of the Roman and Orthodox churches had officially met since the fifteenth century, and the first ever involving thousands of ordinary people of all the modern European faiths - Roman Catholic, Orthodox and Protestant - who joined the delegates in worship. Hans Küng (1990) called it "a model contribution", and he listed (pp 67-69) with approval the unusually frank self-criticisms of the participating churches.

Regional variation in dominant concerns is important and valid, because local communities tend to feel threatened by the lack of recognition of local realities implied by too much emphasis on a global perspective (Gerle 1995). Anyway, the local variation did not obscure the general agreement, at these and at the many other meetings held to discuss the concept of JPIC (listed by Gosling 1992:15), that the addition of the third term to JPIC, concerning the integrity of creation, should be strongly endorsed. The message was further confirmed by several influential books published during this period, such as *God in Creation* (Moltmann 1985), *Imaging God: Dominion as Stewardship* (Hall 1986) and *Liberating Life* (Birch, Eakin, and McDaniel 1990).

The culmination of all this effort was the definitive JPIC World Convocation held in Seoul in March 1990. The key issues at that meeting were the Southern* debt crisis, militarisation, the atmosphere, and racism. The Final Document, reprinted as an appendix to Niles (1992:164-90), lists a series of ten affirmations covering the most important issues of justice, peace and world ecology. The affirmations directly relevant to this thesis were:

7. The creation is beloved of God. We have a responsibility to care for creation, to respect the rights of future generations and to conserve and work for the integrity of creation.

8. The earth is the Lord's. Human use of land and waters should not destroy the life-giving power of the earth.

The affirmations were followed by four covenants, by which Christians were called upon to work, among other things:

3. For preserving the gift of the earth's atmosphere to nurture and sustain the world's life; for building a culture that can live in harmony with creation's integrity; for combating the causes of destructive changes to the atmosphere which threaten to disrupt the earth's climate and create widespread suffering. The Churches can develop new theological perspectives concerning creation and the place of humanity in it, and join the global, local and personal efforts to safeguard the integrity of creation.

The final document from Seoul, strongly influenced by the many representatives attending from the South, describes a worldview grim even in 1990 and getting worse every year, but which is still not high enough in the consciousness or political agendas of most Northern governments:

We have entered a new period of history in which humanity has acquired the capacity to destroy itself. Developments in the areas of economics, politics and technology cannot continue on their present course. More and more people are realizing that a radically new orientation is required if catastrophe is to be avoided. Movements of resistance are taking shape in many parts of the world. Such movements are also growing in the churches (Gerle 1995:63).

One would have to search far to find any such movement in the Anglican Church. Although the then Archbishop of Canterbury, Robert Runcie, urged "strong Anglican support" for the 1989 Basle meeting, few British organisations were represented there. The Bishop of Gloucester summed up the attitude of many British Christians, that the concept of "putting together Justice, Peace and (strange phrase) the Integrity of Creation is a novel idea" (Gosling 1992:73).

Berry (1993b) outlines the history of environmental concern in Britain, and religious responses to it. In general Britons are well aware of problems ahead but not united by the "sense of approaching catastrophe" which galvanised the delegates to the Vancouver meeting in 1983 into the purposeful action that initiated the processes of JPIC. Likewise, the Conference of Churches in Aotearoa New Zealand was quick to point out that the 1990 Seoul meeting coincided with the 150th anniversary of the Treaty of Waitangi, and their booklet on JPIC strongly urged local discussion of the links between JPIC and the Treaty (Anon 1990a). But its long-term impact on local congregations was microscopic.

In 1992, the Rio UNECD Earth Summit added new impetus to the environmental debate (Palmer 1995). It was a huge and chaotic event, divided between an official meeting of Heads of State⁷, a Global Forum of over 1,400 non-government organisations (NGOs), and an ecumenical meeting organised by WCC, all on different sites and all with different agendas. Many mainstream churches prepared statements for it, including the Anglican Communion (Berry 1993a: 263-4). Its consequences have included important new resources for conservation provided by national Governments which committed themselves to participating in various forms of remedial action under Agenda 21 (the development of action plans for the 21st century). If there was any common theme there, it was the open rejection of the assumption, seldom questioned in UN circles before, that all the diverse societies of the world could be put on a single track, along which the "under-developed" countries merely represented an early stage in a desirable and inevitable progress towards the "developed", western way of life.

Historically the Earth Summit will come to mark to time when the world realized that development as traditionally understood had failed (Granberg-Michaelson 1992:1).

The Southern nations insisted that the net flow of resources to the North, due to massive debt repayments and unfavourable terms of trade (S.4), would have to be reversed before there could be any hope of initiating programmes for environmental sustainability in the South, and few had any illusions that the unrestrained free market would help. Against this, the Northern countries, especially the US, worked hard to downplay the criticism of their life styles. One of New Zealand's representatives there, Sir Geoffrey Palmer, describes the US performance as "abysmal" (Palmer 1995), and it was the cause of much anger as it removed all target dates from the climate convention and refused absolutely to sign the biodiversity convention (Wilkinson 1993).

In one respect, the North prevailed: President Bush simply declared that the standard of living of US citizens was not up for negotiation (Rasmussen 1996:133). However the South, and many Northerners with them, did manage to link poverty reduction

⁷ Some 170 nations were represented by their leaders, but not New Zealand. The official commemoration medal presented to Heads of State was given instead to the Maori Queen (R. Laurenson, pers.comm)

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with environmental protection and get them put on the global agenda for everybody, even though the basic policy decisions of business and finance were out of reach altogether. At the same time, during the two weeks of the meeting the global population increased by >3,000,000 (to 5,467,000,000) and the total area of productive arable land decreased by 100,000 ha (Wilkinson 1993). Effective co-operation to deal with these problems was sabotaged by international tensions - which were even worse at Earth Summit II in 1997⁸.

The UNED meeting achieved much less than it might have done: but it did produce Agenda 21, the Rio Declaration and two significant, legally binding conventions on biodiversity and climate change. A third document, intended to become a binding convention on forests, was reduced to a Declaration because the conference could not reach agreement on the wording (Palmer 1995). Many local authorities, including Hamilton City Council, have developed Agenda 21 programmes⁹, while New Zealand is a national signatory to both Conventions, as well as to the separate 1987 Montreal Protocol (Hay 1996).

The Seventh Assembly of WCC in Canberra in 1991 urged the continuance of the work of JPIC (Niles 1992); but Rio showed that the massive participation of NGOs in the debate is now so advanced that a church-based ecumenical movement no longer needs to play a leading role in supporting and stimulating such groups (Granberg-Michaelson 1992:47). In 1994 the WCC reorganised its administration structure, and JPIC was incorporated into a new programme renamed "Theology of Life" (Chial 1996). "What has yet to emerge", comments Chial, "is a theology that significantly inspires change" (ibid., p. 58). This is a lot to ask: the current JPC web page (www.wcc-coe.org/wcc/what/jpc) has a lot of information on peace and justice programmes, but hardly mentions the theology of creation at all.

Fortunately other forms of international consultation on the relationships between religion and the environment have been developing alongside those of WCC (Baker 1996). In 1986 the World Wildlife Fund sponsored a meeting of religious leaders in Assisi, to discuss how each of their communities of faith could contribute towards stimulating environmental awareness and promote conservation within their own

⁸ According to a preliminary report by Jonathon Porritt in BBC Wildlife, August 1997, p. 31.

⁹ See Hamilton's Strategic Plan for 1997-2017, published by Hamilton City Council, p. 9.

traditions (Berry 1993b). The result was renewed interest in studies of how the various sacred writings teach respect for the earth; the initiation of thousands of conservation projects and environmental education programmes around the world; and the creation of the Network on Conservation and Religion (Anon 1995). In 1990 the Joint Appeal by Religion and Science for the Environment was established, followed in 1993 by the National Religious Partnership for Environment, based in New York (www.npre.org) In 1995, a Summit on Religions and Conservation in London, again sponsored by WWF along with the Pilkington Foundation and a Japanese humanitarian foundation brought together religious leaders representing nine of the world's major faiths to review progress since the 1985 meeting (www.onecountry.org). In February 1998 the Archbishop of Canterbury and the President of the World Bank hosted a "Dialogue on World Faiths and Development" at Lambeth Palace (www.worldbank.org). All of this talking and meeting is a step in the right direction, although (as was obvious at Rio) it is unclear to what extent the exhortations of those concerned about *global* survival could influence the *national* policies of those concerned to maintain or improve their own standard of living.

2.3 Origin of the Anglican Fifth Mission Statement

The most authoritative assemblies of the Anglican communion are the Lambeth Conferences, called every ten years by the Archbishop of Canterbury and attended by bishops representing every province in the Anglican world. The Anglican Consultative Council (ACC) was established in 1969 to provide for more frequent and broader-scale discussions between successive Lambeth Conferences. ACC is an international assembly of clergy, bishops and lay people from throughout the Anglican Communion, and it usually meets every three years. The 1988 Lambeth Conference discussed environmental concerns; and its report, plus the events in Basle and Seoul, were discussed by ACC at its 8th meeting in Wales in 1990. In the final report of that meeting, entitled *Mission in a Broken World* (Anon 1990b:101-103), the ACC sought to

bring up to date the definition of mission which has been developing within ACC, and to relate that to the current phase of human history....A consistent view of mission repeated by ACC, the Lambeth Conference [and others]..defines mission in a fourfold way:

The mission of the Church is:

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The mission of the Church is:

- (a) to proclaim the good news of the Kingdom;
- (b) to teach, baptise and nurture new believers;
- (c) to respond to human need by loving service;
- (d) to seek to transform the unjust structures of society.

We now feel that our understanding of the ecological crisis, and indeed of the threats to the unity of all creation, mean that we have to add a fifth affirmation:

- (e) to strive to safeguard the integrity of creation and sustain and renew the life of the earth.

Under the heading “Shaping an Anglican response”, the delegates to ACC8 added:

We ask that the Anglican Justice and Peace Network should effectively: (a) monitor the Anglican Communion’s serious adherence to the Seoul covenants; (b) share examples of specific ways in which these issues are being tackled locally and regionally in different areas.....; (c) develop the common historical and theological analysis needed, and thus move towards a common Christian “confession” on the global crisis; and (d) make recommendations to the Churches for further action through the ACC (ibid: 104-5).

The first four of the Anglican Mission Statements are much as one might expect from any religious organisation, even if a cynic might note that none of the “mainstream churches” in present society are visibly taking their social implications too seriously, especially not those of the fourth one on social justice. Modern churches do not remain open at night in order to offer a place in God’s house for the homeless or the pilgrim, as the medieval cathedrals used to do. Perhaps they have good reasons: yet one vicar who tried, in a poor parish London for 13 years, reported nothing worse than a resident tramp in winter and an occasional mess in the pulpit (Oestreicher 1986: 23). Canon Oestreicher saw his policy as the minimal, necessary and logical step towards closing the “credibility gap.... between the gospel we preached and the life we lived”. But he was regarded as a dangerous radical, and when he was elected to the see of Wellington in 1984, the other New Zealand dioceses refused to confirm the appointment (J.W.Miller, pers. comm.).

On the other hand, the “fifth affirmation” appears, at first glance, as an oddity. The common perception (confirmed by the luke-warm Northern responses to JPIC) is that there is little mention of environmental ethics in the Bible or in traditional spirituality other than the stories of Noah and St Francis, and the idea of caring for creation sounds like an inappropriate matter for the Church to get involved in.

It is true that the Fifth Mission Statement is the odd one out, because it was added several years after the first four. But it is different for other reasons as well. The Fifth Mission Statement is an idealistic mixture of theological and scientific ideas. First, it presupposes a general theology of nature acceptable at least to Anglicans as a group, if not to most Christians. Second, if there is such a theology, the Fifth Mission Statement assumes that it could lead to attitudes and actions by the faithful that could be at least harmonious with conservation policies promoted by secular authorities.

This apparently simple agenda conceals many hidden problems. Conservation policies, like religions, have cultural as well as scientific dimensions - indeed, Lawton (1997) argues that conservation is hardly scientific at all. Cultural filters condition all perceptions and interpretations of the natural world, both within and outside the Church (King 1996), and some of the efforts that have been made over the last century to integrate traditional theology with academic biology (eg those by Teilhard de Chardin or Rupert Sheldrake), have been less than convincing (for different reasons) to either side. Hence there is no widely agreed theoretical framework on which the Fifth Mission Statement can stand, either to teach or exhort Christians or to argue its case with secular opponents.

Because the Fifth Mission Statement is such a very recent concept to Anglicans, it is not surprising that hardly anyone I spoke to between mid May 1994 and late 1996, in Britain or New Zealand, had ever heard of it. A survey conducted throughout New Zealand in 1994 by visiting Dutch theologian H.H.Miskotte found that 22 of 63 interviewees had never heard of JPIC either (Miskotte 1997). When, in February 1995, the Board for Social Responsibility (BSR*) at Church House in London compiled a list of environmental initiatives reported from within the Church of England, only 17 of the 43 dioceses were represented in it (M. Jeffery, pers. comm.). As Gosling (1992:96) put it, “Some feel the need to enlarge the framework of Christian thinking and activity in Britain, but there has so far been little effort to regard JPIC as anything more than an appendage to what most churches regard as more important priorities”.

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However, there is some activity going on behind the scenes. For example, BSR, established in 1969, co-ordinates the Church of England's concern with environmental matters - including, since 1990, its effort to comply with ACC8's request. The Church was already thinking about various ethical issues of human use and abuse of the countryside at the time of the European Conservation Year 1970 (Anon 1970), and has since published a book produced by the Doctrine Commission (Montefiore 1975), and several smaller documents in 1985 and 1991. BSR is also co-ordinating the collection of signatures to support a 1996 WCC petition on climate change, and tries to influence the Church Commissioners and Diocese Managers to manage Church properties (especially graveyards) appropriately.

WCC's JPIC programme has stimulated a substantial output of literature from scholars (Edwards 1992, Ganoczy 1991, Limouris 1990, van Klinken 1991). Nevertheless, it is still obvious that very few ordinary Anglicans are aware of either JPIC or the Fifth Mission Statement, and so far rather little effort has been made to promote either statement among Anglican Churches in Britain or New Zealand¹⁰. That does not mean that the Church is ignoring the issues - only that its discussion of them is apparently being done without reference to them. For example, it was not mentioned even at a very relevant meeting which I attended in London on 23 October 1996, organised by BSR for the English dioceses to discuss the current state of the Anglican response to the environmental debate. The opinion of the Archbishop of Canterbury, George Carey, in a statement read out to the meeting, does not seem to be widely shared:

In my view, environmental challenges are unlikely to be met satisfactorily without the moral and spiritual motivation nurtured by the Churches, and yet, with shining exceptions, our contributions to public debate about environmental responsibility have often been patchy and undistinguished. In my view, environmental responsibilities should be a first order contemporary moral concern of deep interest to Christians (G. Carey, unpubl.)

Many of the post-Rio initiatives organised by the EEC or the British Government include or solicit specifically Christian input. Some dioceses have set up active local

¹⁰ This paucity may be more apparent than real, since all individual dioceses have full autonomy to conduct their own affairs, and there is probably a lot more going on at grassroots level than has so far appeared in print.

Agenda 21 networks, although unfortunately there is no necessary link between these and parallel activities organised by WCC under JPIC. Other organisations are larger and much more formal. For example, the Bishop of Birkenhead represents the Anglican Church on the UK Round Table on Sustainable Development. It has studied energy, freight transport and environmental management and audit, and has current working groups looking at co-ordinated transport, land use, agricultural waste and water supply. The effort made by the people involved to make progress on all these complex issues is large, but, when it comes to offering advice to the Government, the Bishop reports that “input exceeds reception....and the churches are not much better”¹¹. There is apparently no equivalent committee in New Zealand.

The Duke of Edinburgh, then President of the World Wildlife Fund International, convened a series of meetings at Windsor in the late 1980s on “The Christian Attitude to Nature”, challenging the participants to answer the question: “There must be a moral as well as a practical argument for environmental conservation. What is it?” (Berry 1991). A decade later, the Archbishop of Canterbury’s message to the London meeting I attended agreed: because there is a moral dimension to the problem, environmental concern should rightly engage the attention of a religious organisation. The Church is theoretically the place where the ideas behind the Fifth Mission Statement should be best received; and in addition, it has a large network of contacts and considerable social influence, and is the ideal channel for spreading the idea that the friends of God should also be friends of the earth. In S.12.4 I will argue that these amount to strong reasons why the Anglican Church should offer significant leadership to local communities trying to get to grips with these problems.

2.4 Why is concern for creation such a recent addition to the Anglican agenda?

The Christian church in general has no long tradition of concern about the environmental issues that are now so prominent in contemporary society, especially but not only in New Zealand. Hall (1986: 32-35) lists some of the reasons for Christian silence on, and ambiguity to, the natural world:

1. Christian commitment is traditionally seen as intensely personal and interior.

¹¹ Quoted from the Bishop’s verbal report to the BSR meeting of 23 October 1996

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2. The early Christian communities were small, insignificant groups near the bottom of a powerful and decadent society.

3. Early Christian teaching emphasised an intense expectation of the imminent return of Christ to establish God's Kingdom on earth and to bring history to a close.

4. This expectation was later over-ruled by the influence of Hellenistic dualism and pessimism towards nature, which has continued until the twentieth century.

Now, says Hall, Christians have been jolted by Biblical criticism and guilt over the Holocaust to rediscover the ancient Hebraic traditions of the Old Testament, and to rethink the roots of Christianity as a renewal movement within Judaism:

When such thinking is pursued studiously, nothing is more prominent in it than the distinction between Hellenistic world-negation and Hebraic world-orientation (ibid: 34).

5. The early church separated itself from its host culture and concentrated on its own internal life, until the conversion of Constantine allowed the church to achieve a new social status and to accept the Roman social hierarchy as the will of God. Then:

It did not seek to change the world, to transform it according to the standards of 'the kingdom' taught by its Lord; rather, it accepted the existing order, exploiting it for its own benefit...[but either way] the world's fate is no more the ultimate concern of the church after its marriage to empire than it was before (ibid:34).

6. There has been a lot of linguistic confusion caused by the translation to the single English word "world" of three different Greek words with overlapping meanings but different overtones - *oikoumene* (household), *aion* (age), and *kosmos* (nature).

Further confusion has arisen between the incompatible concepts of divine sovereignty versus human responsibility for a desacralised nature (S.10.3.3).

Another explanation could be that the significance of the *spiritual contexts* of contemporary concerns about conservation have been ignored. Neither extreme of the current spectrum of Christian spirituality has seen it as important: Charismatics fear contamination by "New Age" philosophies (Campolo 1992), and conservatives are often identified with the established Anglican Church and its links with the land-owning class, which would not welcome criticism of the status quo. (Ever since Constantine, the conservative elements of society have had much to gain from supporting established religion, and vice versa). If no social group has any interest in seeing conservation promoted to church-goers, it is not surprising that the latter have remained ignorant of its spiritual implications.

For these and no doubt other reasons, post-Constantinian Christianity has been predominantly an anthropocentric and conservative religion. It is widely perceived to have been far too slow in responding to the environmental crisis and in amending its traditionally negative teaching on nature (Vaney 1993), and it is therefore seen as irrelevant to the contemporary discussion. Yet Rasmussen (1996:14) concludes that it is not the initial lack of readiness of religions to meet new crises that is reprehensible, but their refusal to be transformed by them. Of course, any long-established organisation must necessarily juggle its opposite obligations: both to pay attention to different issues at different times, in order to remain relevant to contemporary society, and also to retain contacts with its roots, in order to remain true to its traditions. With such a long history behind it, that is a problem for the Church far more than for any secular organisation. But Christians were taking part in the debate right from the earliest days of the secular environmental movement in the 1960s¹². Joseph Sittler's pioneering effort to awaken Christian consciousness at New Delhi in 1961 met with incomprehension, as pioneering efforts so often do, but at least he shows that a few Christians were awake as soon as anyone.

In the 30 years since White (1967) accused Christianity of being partially responsible for aiding and abetting the modern environmental crisis, there have been many justifiable critiques (e.g., by McDonagh 1994) of his inaccurate interpretation of the Genesis text, poor exegesis and few sources. It is hardly reasonable to hold Christianity responsible when people in non-Christian cultures are just as destructive: the Polynesians on Easter Island, and the Greeks and Romans around the Mediterranean, ruined their soils and forests too (Bahn and Flenley 1992, Runnels 1995, Seymour and Girardet 1990). Neither is it reasonable to ignore the rise of technology (Moltmann 1985), or to assume that people have ever paid such careful attention to any Biblical command. But White did a great service in showing how historic Christianity has emphasised inner sanctity at the expense of any theology of nature. It is fair to accept that later Christianity did contribute to attitudes that encouraged irresponsible environmental exploitation – especially by drawing such a sharp line between the world of nature and the world of the soul (Barbour 1997:268). To this day there remains a correlation between a high level of fundamentalist and/or

¹² On the other hand, it is fair to point out that environmentalism is a recent issue in secular thinking too - environmental concern first became a matter of public debate only in the 1960s, as the effects of rapid post-war growth and development became noticeable.

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apocalyptic expectations in a local congregation and a general disinterest in conservation (Eckberg and Blocker 1996).

The preference for literalism shown by the fundamentalist churches is often correlated with a lack of serious theological education. Both encourage uncritical reading of the New Testament, and that - especially the Book of Revelation - easily leads to the conclusion that, if heaven and earth are to pass away, there can be no point in protecting them.

Primavesi (1991:81-2) comments that, if one tries to introduce the subject of conservation at a religious gathering, one may be told, "as I have been, that it is nothing to do with religion". How could this be, considering that only a few centuries ago, religion was understood to explain everything? Primavesi blames the non-historical context of much church teaching and the distracting effect of an obsession with internal church politics. An alternative list of explanations appears in the discussion document provided for the 1987 WCC meeting at Glion:

- (1) the marginalisation of God by reductionist science*;
- (2) the separation of the sacred from the profane;
- (3) the complicity of the churches in the dominant power structures of society; and
- (4) the hypocrisy of the churches in failing to campaign vigorously for the equality of all people, including women, homosexuals, and the third world poor (Rajotte 1987).

No wonder the very substantial contemporary active research on the environmental crisis is done almost entirely by secular rather than religious organisations.

One might ask, then, is the contemporary Church merely adopting an issue of current public interest, merely in order to become "relevant", or does it really have some unique perspective on the environmental debate? Recent developments in Christian theology (S.10.1) might - when absorbed by enough clergy and people - eventually help overcome the Church's credibility problem. After all, the very recent origin of the debate has caught out other long-lived institutions too – such as conservative political parties. So the church's historical silence is no more a disqualification to speak now than its current interest is a mere appeal to popular concerns. As Mary Midgley has remarked: "Some of us have been at this subject longer than others, but it will take everybody's efforts if we are to get anywhere"¹³.

¹³ Mary Midgley, at the Oxford Templeton conference, July 1996.

In my view it is fair to reject the cynical suspicion that the Church has suddenly become interested in conservation only to appeal to a “green” membership. But it is still necessary to ask, does the Church have any particular contribution to make to the debate that is not already being made by any of the very large number of other, secular participants? Yes, it does (Oelschlaeger 1994, Rue 1989). Christians assert that trinitarian belief does indeed offer a unique perspective on the questions of environmental management (S.10.3.1), which can add a valuable dimension to the debate acceptable both to science and to believers of other persuasions. Others will bring to the debate different perspectives of their own, and that is right and proper, but, as Baker (1995:80) points out, Christians have to engage in the environmental debate on the basis of their faith in a good and loving Creator and in the theology of the incarnation.

2.5 The New Zealand response

The statement that “caring for creation” is now one of the official objectives of the New Zealand Anglican Church tends to come as a surprise to many people. The New Zealand Prayer Book provides a whole liturgy on the theme of “Thanksgiving for Creation and Redemption”, including a new canticle, *Benedicite Aotearoa* (Anglican Church 1989:457), but the theological reasoning behind the idea that “rabbits and cattle, moths and dogs” might “give to our God your thanks and praise” remains obscure to the average pew-sitter, and an astonishment to almost all outsiders.

This general surprise illustrates how extremely widespread is the common idea criticised by White (1967), and supported by influential secular philosophers¹⁴, that all creatures were originally made exclusively for human benefit - even though that concept is not to be found anywhere in Genesis (Baker 1995:76). These attitudes

¹⁴ Kant saw nature as the arena for humanity to achieve spiritual freedom: nature has no intrinsic value, no part of it has any rights, and its worth is purely instrumental and subordinate to humans. God has been liberated from running the world of nature by Bacon, Descartes, Newton and Darwin, and from human affairs by Locke, Mill, Adam Smith and Freud. Perhaps it is hardly surprising that the church found itself with nothing left to say about God’s activity in the world (Rajotte 1987).

2: The Fifth Mission Statement

have entered public perceptions of what the Church is all about, so it is clear it will not be easy to change them.

A recent attempt to broach the subject by the Creation Working Group of the Doctrine Commission of the Anglican Church in Aotearoa, New Zealand and Polynesia illustrated the difficulty of the task. In November 1995, the Group (three churchmen, none also a practising scientist¹⁵) produced a draft report entitled *Anglican Theology and Theologies of Creation*, to be submitted to General Synod of 1996. It was circulated to the dioceses for comment, and I was one of those asked to respond to it. Certainly, credit is due to General Synod for recognising the need for such a report, and to the authors for making the attempt to meet the need, but the document they produced was quite inadequate. General Synod accepted the criticisms it received (not only from me), and dropped the draft report - largely because there seemed little hope of defining a *single* Anglican theology of creation. But progress may be expected in future: General Synod of 1998 approved a motion (Mrs F Matalavea/Mr D Shaw) "to appoint a co-ordinator, adequately resourced, whose purpose and function will be to educate, motivate and encourage the whole church in the area of Care of Creation"¹⁶. The 1998 Lambeth Conference approved a similar motion, with as yet unknown effect.

There have been several conferences and teaching workshops designed to introduce congregations to the theological and scientific imperatives behind the Fifth Mission Statement. Some of their proceedings have been published, though none have been widely promoted within and outside the Christian community. For example, at a weekend conference on "Ecology and Christian living" in Auckland in April 1989, several very thoughtful papers were presented to an audience of 240 people. The report of its proceedings was published as a slim booklet entitled *Repainting the Rainbow* (Galvin and Kearns 1989), but it got far less attention from the wider

¹⁵ Hugh Paterson, Sue Patterson and Stephen May. I am personally acquainted only with Stephen May; he told me he had not seen the draft before it was sent out with his name on it.

¹⁶ According to Jan Richmond, Convenor of the Creation and Environment Council of the Diocese of Wellington, nothing has happened yet (pers. comm, March 1999)

church than it deserved. Similar (unpublished) workshops were held in Napier in 1991 and in Wellington in 1992, in both of which I participated, and another in Wellington (Anon 1994), in which I did not. I have been interested in this subject for years, but have never seen any of these events or reports publicised in church.

PART II: BACKGROUND PARADIGMS

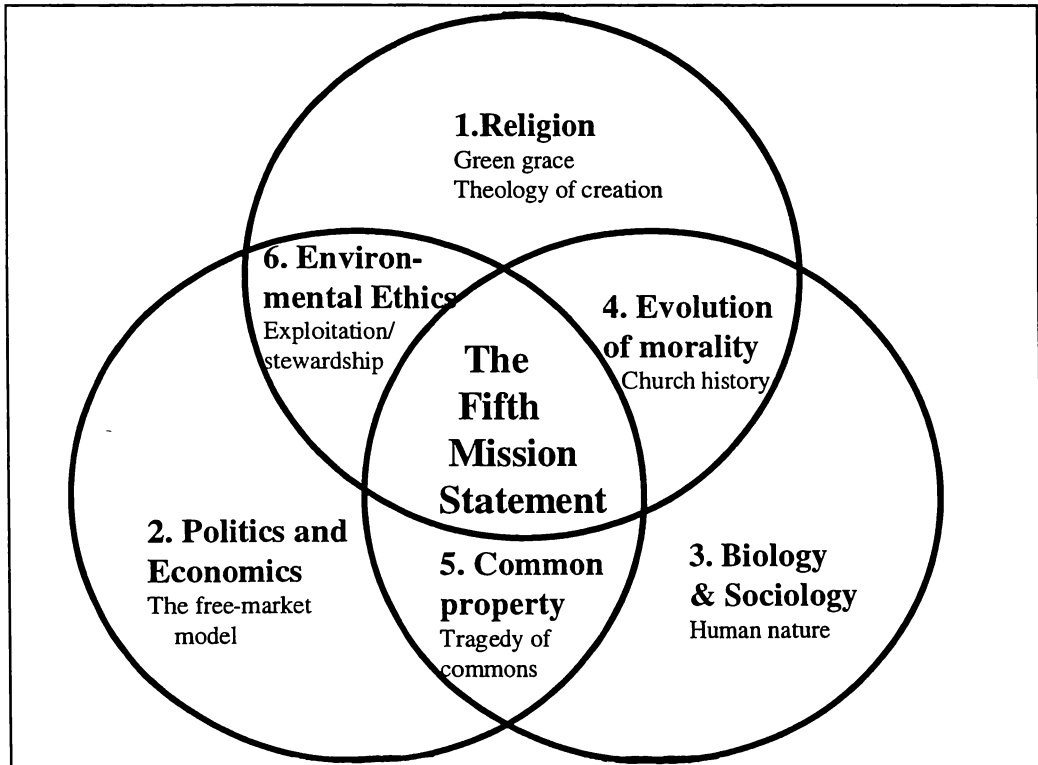
3. INTRODUCTION

Despite the strong convictions conveyed by the authors of the Seoul declarations and the Fifth Mission Statement, the cold hard fact remains that practically nothing has changed. S.2 shows that there has been no very obvious response by people, congregations, corporations or governments, and the global crisis continues on its way as before. We urgently need to know, why have these perfectly serious efforts by official and otherwise respected organisations apparently had so little effect? As usual with such a large question, there are many answers. But my suggestion is that the Church tends to underestimate the importance of recognising the cultural and historical environment in which it operates. As Primavesi (1991) puts it, the churches in general perceive their teachings as pure deposits of truth handed down through generations of social, political and cultural vacuum. To any student of the human animal, this is nonsense.

The Anglican Church is not only a fellowship of the redeemed and a beacon of grace despite itself: it is also a human organisation co-existing with many other human organisations in a secular world. It is like them in very many practical details, and unlike them mainly in the length of the history behind it. Of course its internal life is nourished by many ancient and profound spiritual traditions, and its attitudes to material things are or should be somewhat different from that of other human organisations. But it also has to conduct its affairs with due regard to the wider social and environmental forces that strongly influence the character of the society it currently inhabits. Just as Paul adapted the message of the early church to take account of the cultural background of the Greek world he preached in, so we have to take account of the cultural background of the modern world. The longer the Church continues to be slow to do this, the longer its ancient authority will continue to trickle away.

The Fifth Mission Statement is about Christian attitudes to managing the environmental crisis, which in turn is partly a moral problem, partly a political and economic one, and partly a scientific one. There are, then, three overlapping spheres of primary knowledge that are relevant to it, as illustrated in Fig 2:

Fig 2 The three cultural contexts in which the Fifth Mission Statement has to operate.



1. the realm of religion, not only the specifically Christian intellectual understanding of creation, but also the more general experience of the numinous in it;
2. the realm of the economic and political realities that govern human use and management of natural resources, most particularly the current free-market model; and
3. the realm of science, specifically the current secular biological understanding of the evolved nature and social behaviour of humans.

Each one of these three fields of knowledge overlap with the other two, and the fields of overlap define three sets of interactions:

4. the meeting of biology and sociology with religion is the arena for discussing how the processes of natural selection influence human philosophical systems, as illustrated by the evolution of morality and the history of the church;

3. Introduction

5. the meeting of biology and sociology with politics and economics is the arena for discussing why human nature makes sharing of common-pool environmental resources so difficult; and
6. the meeting of politics and economics with religion is the arena for discussing environmental ethics, and particularly why different human groups have developed such different cultural attitudes to environmental management.

The Fifth Mission Statement occupies the seventh, central field of the diagram, the area that all three primary spheres have in common. It seems clear that no formulation of the Fifth Mission Statement that ignores the other six fields which influence it is likely to be either intellectually respectable or effective in practice.

The human environment is only a small part of the whole creation of God, but since (so far as we know) we are the only creatures capable of caring for any of it, our concern should extend to all of it. Hence, the idea of environmental management, usually considered a secular discipline with a variety of sub-disciplines, is merely a subset of the wider task of caring for creation as conceived by the Fifth Mission Statement. However, even the more limited aim of environmental management is difficult enough, for two main reasons. First, the natural world is far more complicated and unpredictable than our theoretical models can handle, which means that errors in management decisions are far more common than we like to admit (Budiansky 1995, Caughley and Gunn 1996). Second, the human environment is a common resource for all humanity, and management of it is not the business of one or a few individuals but a matter for collective action by many people whose interests usually do not coincide.

For both reasons, management of the environment, like that of any common property, is not a simple task. Organising fair and just collective action among a population of independent egoists is a problem that has exercised secular philosophers, legislators and lawyers for centuries. Their disciplines have histories of their own, reflecting their independent development particularly within the liberal intellectual atmosphere of western civilisation over the last two centuries. But since Rio it has become clear that Northern style economic growth and progress are not normal and cannot be continued indefinitely. The environmental crisis is not merely a problem of applied ecology; it has wider and deeper dimensions, which are a lot more frightening and so are explored less often:

A century ago Thoreau could truly say, "There are a thousand hacking at the branches of evil to one who is striking at the root". This is not as true now as it was in Thoreau's day, but whether we are more successful in eradicating evil is questionable. We have trouble recognising a major root when we see it (Hardin and Baden 1977: 5).

The interactions summarised in Fig 2 also have a time dimension. It is useful to distinguish between the short term, localised environmental dilemmas that face all Northern societies, including that of New Zealand, and the longer term global crisis that threatens humanity as a whole.

The short-term dilemma is that the development and implementation of environmental policies within a western democracy is largely, though not entirely, a matter of common property management. The associated problems are not new: there is a well established branch of conventional economic theory specialising in it, and a vast literature on the culture and management of communal resources (e.g. Hardin and Baden 1977, Keohane and Ostrom 1995, McCay and Acheson 1987, Stevenson 1991). On the local and short-term scales on which we as individuals all live, common property will probably always have to be managed according to some sort of updated version of this theory, so we must learn to develop and monitor the best means of doing that. On the other hand, the longer term crisis cannot be addressed within the framework of conventional macro-economic theory, because it is that theory itself which is at issue. The associated problems are completely new, and indeed not officially recognised by many economists, so the literature is so far confined to a few prophetic and unpopular voices such as Daly & Cobb (1990) and Ehrenfeld (1981). They, in their turn, are often half-drowned in the "brownlash" from the vested interests they criticise (Ehrlich and Ehrlich 1996). We need to address both the short-term and the long-term perspectives, together and separately, and their implications for the Church's hopes to make a contribution to the environmental debate in the twenty-first century.

4 LONG-TERM ECONOMICS: THE FREE-MARKET GLOBAL MODEL

The modern world is a largely product of the intellectual model of economic and social progress that presently dominates all Northern political systems. It is only half a century old (its foundations were laid at the 1944 Bretton Woods conference which planned the post-war recovery of the Northern economies), but it has led to

unprecedented material affluence, significant advances in health care, the widespread extension of tertiary education, extraordinary technological innovation, the consolidation of liberty and democracy, the flourishing of popular culture: with such success, few have questioned either the goal or the method. Indeed, the model of progress has been adoptedby almost every country in the world....the entire planet is now bound up in a single, global process of economic and social development (Jacobs 1996:7).

It is important to appreciate this framework in which we live, because it is, for the moment, one of the key features of the environment in which the Fifth Mission Statement must operate. As recent events in New Zealand amply demonstrate, it is characterised by the rampant globalisation of markets, increasing international mobility of capital and consequent lack of control over financial policy by any national government. Its effects include unstoppable technological advance regardless of ethical considerations, collapsing patterns of traditional life, and the transformations of social and cultural institutions concerned with health and education even in the teeth of public protest.

Jacobs (1996) believes that we may be witnessing the first generation in 150 years that is reluctantly coming to believe that “progress” may have ended, that our childrens’ experience of life may well be worse, not better than our own (Jacobs 1996:2). In a MORI poll conducted in Britain in April 1995, a nationally representative sample of 1069 people over 15 was asked “Do you think that the kind of world that today’s children will inherit will be better or worse than the kind of world that children of your generation inherited, or about the same?” The answers were: Better, 12%; Worse, 60%; Similar, 25%; Don’t know, 4%. A second, independent poll of the same size by Gallup, and asking almost the same question at about the same time, gave

essentially the same answers: Better 18%; Worse 63%; Similar 15%; Don't know 4% (Jacobs 1996:3). Meanwhile, politicians daily sabotage all hope of intelligent debate by short-term party bickering. The political establishment seems to be rudderless and powerless, tossed about on a sea of petty problems, while underneath us the deep ocean currents of global change move us inexorably into the unknown (Jacobs 1996).

Jacobs suggests some possible reasons for this widespread pessimism. Almost two thirds of the people questioned in both samples could see, with a clarity and understanding quite missing from (or concealed in) the political arena, the growing crisis of humankind's impact upon the natural world. They and thousands like them read authoritative reports such as that of Brundland (1987), documenting the growth of material consumption and of population that inevitably generates ever-greater crowding, pollution and degradation of resources. They watch news film of poverty, famine and conflict in distant places, and realise that western society cannot totally disclaim responsibility.

The free-market model has been hugely successful. It works by systematic privatisation of profits to individuals or small groups, coupled with (wherever possible) socialisation of costs to the most vulnerable human and natural systems. That means that all our technological advances have been achieved by the progressive sacrifice of two of humanity's most treasured traditional assets: a supportive local community and a healthy, productive natural environment. The loss of community is now all too obvious in crime, drugs and vandalism; the loss and degradation of the natural environment is a clear threat to long-term human survival (Paul Ekins, in Daly and Cobb 1990:vii).

Not all economists are blind to the social consequences of the dominant, free-market model. One of its most persistent critics has been J.K. Galbraith, who has frequently pointed out, eg in *The Culture of Contentment* (1992) and *The Good Society* (1996), the wider implications of our worship of the affluent society. Another is Noam Chomsky, whose cogent criticisms of the current state of world economic and business systems galvanised a sell-out audience at the Waikato University School of Management in November 1998 (Chomsky and Barsamian 1998). Ormerod (1994) went so far as to entitle his analysis of the failings of the contemporary version of the model *The Death of Economics*. Most worrying is the verdict of Herman Daly, formerly an economist at the World Bank, and John Cobb, a theologian, who joined

4: Long-term Economics - the Free-market Global Model

forces to compile their own and many previous objections into a stinging critique of conventional economics, entitled *For the Common Good: Redirecting the Economy towards Community, the Environment and a Sustainable Future* (1990).

Unfortunately, mainstream economists are good at ignoring criticism, because they are convinced that “the great majority of people are far more interested in the economic goods whose production economists have encouraged than in any psychological or environmental losses” (ibid: 4).

The free-market model is based on a fictional character, *Homo economicus*, a being that will always act rationally so as to optimise its own interests (Daly and Cobb 1990: 5). Common experience confirms that as, all-too-often, a reasonable assumption. But the free-market model goes further than that: it equates intelligent pursuit of private gain with rationality, thereby implying that all other behaviour, such as concern for the public good, is not rational. This is a radical departure from the mindset of the founding father of economics, Adam Smith, who took it for granted that the “invisible hand” (S.6.6.1) - the idea that individuals pursuing their own interests would ultimately benefit society - would work for the common good because people would *automatically* take the public good into account when making private decisions for personal benefit (Ormerod 1994). In fact, Smith emphasised that the market is a system so dangerous that it presupposes the moral force of shared community values as a necessary restraining context (Daly and Cobb 1990: 140). If any such force existed in Smith’s day, it is now long gone.

On the other hand, many economists wedded to the model seem not to notice the paradox that they are capable of surpassing irrationalities of their own, such as refusing to accept the idea that there could be a genuine, inescapable material limit to economic growth. Rasmussen (1996: 112) quotes Lawrence Summers, Chief Economist at the World Bank, as stating categorically that there are no limits to the carrying capacity of the earth, so the idea that we should put limits on growth to accommodate some natural limit is a “profound error”. Other so-called “cornucopian economists” are quoted by Daly (1990:109): for example

The United States must overcomethe illusion that resources and capital are essentially things, which can run out, rather than products of the human will and imagination which in freedom are inexhaustible (George Gilder)

You see, in the end, copper and oil come out of our minds. That's really where they are (Julian Simon)

I had read such quotations in the literature, but had assumed that such statements were made for political reasons; the idea that anyone might really, personally believe such nonsense seemed incredible. Then I happened to be seated next to an economist from the White House at a College dinner during my study leave in Oxford, who genuinely believed in the concept that, in principle, economic growth can be sustained indefinitely, and could not understand why I had difficulty in accepting it. I wish I had thought to try on him a quote from Kenneth Boulding - himself an economist - : "Anyone who believes that exponential growth can go on forever in a finite world is either a madman or an economist" (Anon 1994:55).

The cornucopians are greatly encouraged by the frequent failure of predictions that vital resources will inevitably become exhausted or prohibitively expensive within the foreseeable future. In 1980 Julian Simon challenged Paul Ehrlich and others to take on a ten-year bet that the prices of five selected metals would fall rather than rise by 1990. Simon won the bet, partly because a global recession during the early 1990s slowed demand for industrial metals world wide (Ehrlich and Ehrlich 1996: 100-105). He continued to claim that every measure of material and environmental welfare in the world continues to improve, but he would not take on a second bet concerning another 15 trends in human welfare for another ten years, including measures of climate change, areas of cropland and tropical forest per person, distribution of AIDS, and the gap between rich and poor.

It is easy to see that the cornucopian economists are unfamiliar with some basic facts about biology. Humans now dominate all earth's ecosystems: they monopolise somewhere between 39 to 50% of the land area of the earth¹⁷, about 66% of recognised marine fisheries, more than half of all accessible rainwater, and in places more than that of irreplaceable fossil groundwater (Vitousek et al. 1997). One more doubling of the human population, which would take only about 35 years at 2% a year, and human life would require >80% of the net primary productivity and of the freshwater supplies of the planet. But of course, since humans cannot live without other ecosystems, that last doubling cannot happen without unimaginable consequences both for most humans and for nature. Besides, long before then,

¹⁷ "monopoly" here includes both transforming or degrading a resource by human enterprise, and excluding other species from using it

Leibig's Law will come into effect: carrying capacity will be ultimately determined not by general conditions but by that single factor in least supply. The effects of allowing human density to reach such a figure, for wild life and for all but a few of the world's wealthiest people, do not bear thinking about. So most people don't think about them, and things carry on as usual.

4.1 The failings of the free-market economic model

In the 1980s a particular form of the free-market economic model became dominant in most Northern countries, and in the international institutions governed by them (Jacobs 1996:8, Kelsey 1997). It involved abandoning the objective of full employment, imposing rigorous measures to control inflation at almost any social cost, making drastic cuts in public spending and increasing reliance upon private provision of welfare services such as health, education and pensions. Economic and social policies in Southern developing countries have also been applied on the same principles, as the main condition of development aid and finance provided by the International Monetary Fund and kindred organisations.

But the economic model underlying these policies is dangerously deceptive, for a number of reasons:

1. The model is based on what Whitehead (1927:64) called the "fallacy of misplaced concreteness", the tendency to organise knowledge in terms of abstractions and then to reach conclusions and apply them to the real world as if abstractions and reality were the same thing. For example, if an abstract symbol called money can grow indefinitely at compound interest, so also can copper and oil. When the distinctions between abstraction and reality are forgotten, trouble follows. Abstract models cannot be all-inclusive: certain elements have to be omitted from them, because, say, they cannot be defined precisely enough, even if they are vital to the workings of the system modelled. Economists tend to label these elements "externalities", largely so as to avoid any challenge to the model. Garrett Hardin's famous fable *The Tragedy of the Commons* is an especially clear case of the inexorable workings of uncontrolled externalities and the false conclusions that such thinking leads to (S.5). Yet theoretical economists continue to think this way, and that represents an extremely serious danger to all the rest of us who have to

live in a real world governed by their experiments. The consequences for New Zealand are eloquently described by Kelsey (1997).

2. It is one thing to show that the optimal allocation of resources can result from the mechanical interplay of individual self-interests. It is quite another thing to neglect the effect of one person's welfare on that of others, or to dismiss as externalities elements of reality omitted from economic abstractions that are not minor details but part of the very fabric of all existence. When vital issues, such as the capacity of the earth to support life, have to be classed as externalities, it is time to restructure basic concepts and start with a different set of abstractions that can embrace what was previously external (Daly and Cobb 1990:36-37).
3. The market is not the end of society and is not the right instrument through which the ends of society should be met (ibid:14). The theory that wealth would automatically "trickle down" from rich to poor has been proved simply wrong: rather, it now appears that wealth can circulate and expand within geographic and economic class boundaries to the exclusion of those outside them (Jacobs 1996:9). To give only a single example, the rosy periwinkle is a small plant endemic to Madagascar, which contains two chemicals, vincristine and vinblastine. They were discovered by accident to be effective cures of the deadly cancers lymphocytic leukemia and Hodgkin's disease. They have saved thousands of lives, and generate \$US 200 million a year in drug sales, but the people of Madagascar have seen none of the profits reaped by pharmaceutical companies in exploiting their genetic heritage (Leakey and Lewin 1996: 133). The current Treaty of Waitangi claim known as Wai 262, seeking intellectual property rights over the use of New Zealand's indigenous fauna and flora, will, if approved, protect the Maori¹⁸ from a similar deprivation (Taylor and Smith 1997:2.15).
4. The assumption that developing countries should be encouraged to emulate the development path and economic strategies of the west is invalid, because it fails to take account of the special and unrepeatable historical conditions that fuelled the Industrial Revolution in Britain: 1. The accumulation of capital, mainly as a result of the enclosures of formerly common land and the exploitation of colonies;

¹⁸ The claim assumes that profits derived from indigenous flora and fauna belong only to New Zealanders of the Maori race, rather than all New Zealanders of any race. It could be argued that any potentially valuable drugs derived from natural resources would have no commercial value worth disputing over if they were not developed by the global pharmaceutical industry, which owes nothing to Maori ownership.

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2. The prevalence of cheap labour, especially as supplied by migration to the cities of former agricultural workers after the enclosures; 3. The ready supply of resources, especially iron and coal, plus imports from around the world guaranteed by British naval supremacy; 4. Early mechanisation and mass production; 5. Organisation of factories and division of labour, both very cost efficient but dehumanising; 6. Control of markets, by repressive legislation when necessary; 7. Economic growth, first as a consequence of all the above and later as an end in itself (Ambler 1990).
5. In practice, the imposition of modern economic theory on the South has been completely disastrous. The international debt crisis has developed over the last 20-25 years, starting with the oil shocks of 1973 and 1979 and the consequent increases in the prices of manufactured goods. The increased costs and reduced competitiveness in Southern countries jeopardised their ability to service their existing loans, so the IMF and banks with oil profits to lend helped out with further loans in the expectation that the South would recover. But that has not happened so, to secure their assets, IMF began to impose severe conditions, including the detested structural adjustment policies that have often had the effect of diverting so much productivity into cash crops for export that the basic needs of the local people are going unmet. Far too often the result has been accelerating social disintegration, which opened the door to a military dictatorship. The debts of the poor South are now subsidising the rich economies of the North to a scarcely credible extent. Between 1982 and 1990, in debt service alone, the South sent the North \$US 418 billion more than it received in all forms of Northern aid. Earnest discussions and negotiations at Rio made no difference: in 1993, the world's 40 poorest countries (30 of them in sub-Saharan Africa) paid \$19 billion more in debt and interest than they received in aid (Athanasίου 1996: 214). The increasingly desperate Southern governments have already returned far more money than was borrowed, and the remainder still owed far outstrips capacity of the poorest countries to pay. The only way they can find even a proportion of the money demanded is by progressively more draconian cutbacks in social programmes and environmental protection at home. Any concept of nature conservation in the South is, not surprisingly, under near-mortal stress.
6. There is a fundamental conflict between social and environmental protection and the demands of deregulated international trade. Hard-won environmental treaties involving restrictions on trade are vulnerable to challenge under GATT rules - not only the CITES regulations that explicitly prevent trade in endangered species, but various other regulations including the much-vaunted Montreal protocol protecting the ozone layer and the international moratorium on whaling. Free

trade and healthy local communities are simply incompatible: hence the quotation from J. M. Keynes that stands at the head of the chapter entitled "Free Trade Versus Community" in Daly & Cobb (1990): "Ideas, knowledge, art, hospitality, travel - these are the things which should of their nature be international. But let goods be homespun whenever it is reasonably and conveniently possible; and, above all, let finance be primarily national". Such ideas can be expected to meet strong resistance from big business, the architects of GATT in New Zealand. Businesses benefit too much from the way GATT allows large companies to shop around the world for the best way to externalise their costs into human and natural communities (Rasmussen 1996:81). However, the conditions governing open competition may change in future (S 12.4.2).

7. GNP, universally used as a measure of the health of an economy, is actually a pointless statistical abstraction that counts all economic activity without regard to whether it is desirable or not (e.g., both the production of cars and the ambulances to clear the carnage; both locks for doors and jails for people who break them); it "measures everything except that which makes life worthwhile" (Robert Kennedy, as quoted by Friends of the Earth Europe 1995: 163). It is true that much of the growth in GNP is due to added value, eg by exporting processed goods instead of raw materials: (Hartley 1997:40): but in that case politicians have no grounds for regarding increases in GNP as equivalent to increased productivity, which they usually do.
8. The new environmental and social problems that have appeared in the last twenty years cannot be addressed by further economic growth on the pattern of the recent past or by the "add-on" technical fixes so much beloved by the cornucopians. They include the greenhouse effect, the depletion of the ozone layer and of ocean fisheries and the accelerating loss of biodiversity, plus social aggravations such as the massive growth in road traffic and its associated costs in air pollution, congestion and damage to the countryside from road building in the North, and mass poverty in the South.

The key point is that all these problems are symptoms, not of the failure of the model, but of its *success*, so the better the model performs, the worse they will get. Dealing with them will require systematic and fundamental changes in accepted patterns of growth and development, which have been advocated for years (Hawken 1993) but which politicians are not yet willing to attempt (Jacobs 1996:11).

4: Long-term Economics - the Free-market Global Model

Critics of free-market economics argue that the costs of pursuing Northern-style economic policies and of imposing them on the rest of the world are now ethically and socially unacceptable. The economists who usually claim that any increase in relative social deprivation and in environmental degradation would be temporary and outweighed by the benefits of economic development seldom have to experience directly the results of their cost-benefit calculus.

The argument would be morally dubious even if all sections of society were guaranteed to share the benefits of the liberalised market economy; but experience in New Zealand and in Britain has shown clearly that the effect is quite the opposite. Increasing social inequality is now leaving substantial sections of the poor and unemployed permanently excluded from mainstream society, while the effects of the application of market principles to the long-term viability of indigenous forests, fisheries and marginal agriculture can hardly be dismissed as temporary. All this is not surprising, since it surely is in the nature of commercial development to avoid sharing the benefits of its activities so far as possible, most especially if the potential beneficiaries are unable to argue for themselves. The number of these is increasing, because one of the most relentless effects of free-market economics is that the rich get richer and the poor get poorer. In the 1750s, living standards in the North were not much higher than in the South, but by 1989 the richest 20% of the world population got 82.7% of the total income, while the poorest 20% got 1.4% (Athanasίου 1996:53). The gap has probably widened since then, right around the world – as it certainly has in New Zealand. Recent research on income inequality by Srikanth Chatterjee (Massey University) and Nripesh Popper (University of New South Wales) shows that, during the years of economic reform (1984-96), the share of the national wealth gained by the bottom 80% of our society has declined, while that gained by the top 5% has increased by a massive 25%¹⁹.

A second concern about the present policies should be more telling, because it appeals to the self-interest that drives the dominant model. Social and environmental decay due ultimately to economic policy inevitably affect everyone, even the affluent. In the North, chemicalised food production and the introduction of genetically modified crops increase private profits without regard for the common good: on the global scale, the combination of poverty, population growth, and unbearable foreign debt accelerate multiple environmental woes (deforestation, soil erosion,

¹⁹ This research was widely reported in the media in September 1998 but has not yet been formally published.

desertification.....) and must ultimately increase tension and international conflict. For their own security, therefore, the Northern nations must consider the conclusion of Jacobs (1996:12):

The argument, therefore, is not simply that the dominant patterns of economic development, in Britain [New Zealand] and the world as a whole, are wrong morally. It is that they are now counter-productive. They are no longer generating net benefits, but net costs; and these costs are increasing. Change is therefore imperative...not just in the patterns of economic development, but in the model that informs them. We need to reassess what we mean by economic and social progress.

Perhaps the most serious criticism of free-market economics is its immense social costs. Daly & Cobb (1990) point out that economics based on *Homo economicus* as a self-interested individual inevitably leads to policies that disrupt social relationships, yet economic planners cannot consider these costs except as externalities, and do not pay much attention to them even then. This process and its consequences are better known in New Zealand than almost anywhere, and in fact the recent reforms in New Zealand are held up as an example to the rest of the world of the benefits of this model (Kelsey 1997). According to Sir Christopher Tickell²⁰, the intellectual hegemony of the free-market model is fading, and its general claim to drive social progress is no longer accepted in the academic world: but its grip on the world of business affairs is still very strong, and the self-interest of its practitioners will ensure that it will hold on for a long time yet.

To be fair, the radical free-market philosophy is already restrained to some extent by social concern, at least in New Zealand, otherwise no state agency would intervene in market processes, even to keep the destitute from starving to death. The argument is over *to what level* social considerations should step in to split the difference between competition and co-operation and thereby avoid a stratification of society too great for national security (Cavanaugh 1996: 227). But the cynic would say that even that degree of restraint is based less on compassion than on the knowledge that people do not support a society unless they have a stake in it. Past a certain point of differential between the top and the bottom of society, those at the bottom are likely to

²⁰ Master of Green College, Oxford, and a leading voice in the environmental debate in UK.

resort to revolution as a more effective means of redistributing wealth when the “invisible hand” and the “trickle-down” effect have failed (Cavanaugh 1996: 227).

4.2 The shift to sustainability

In contemporary conditions, perhaps the best definition of *appropriate economic and social progress* would be a deliberate shift towards sustainability. However, the word “sustainability” has hidden snags, and is understood by different people in different ways.

For example, the distinction between renewable and non-renewable resources is well known, and it is easy to suppose that sustainability merely means developing renewable sources of energy and raw materials in order to postpone the time when the non-renewable fossil fuels and minerals will run out. But our understanding of the relationship between the two has changed. For example, the problem with fossil fuels now is not so much their depletion as the pollution they cause; and the problem with renewable energy is that the harvest rate either must not or cannot exceed the regeneration rate. Since the generation rate of, say, electricity from wind or water power always has a well-defined ceiling, that means that the usage rate is also strictly limited. For other sorts of renewable resources, such as forests or fisheries, setting a harvest rate depends on humans getting their calculations right: if the equation is misjudged, stocks will be in danger of declining to extinction, and the resource will have been converted from renewable to non-renewable²¹ Either sort of limitation on harvest rate will be unwelcome, and will certainly have drastic effects on economic activity.

The concept of sustainable development was strongly endorsed by the World Commission on Environment and Development (Bruntland 1987). The Commission defined it as: “Development which meets the needs of the present without compromising the ability of future generations to meet their own needs”. The UN Environment Programme/ World Wide Fund for Nature/ World Conservation Union

²¹ Miscalculations are easy, since nature is not nearly as predictable as a computer model (Budiandsky 1995), and what appears to be a predictably stable, sustainable yield may produce more than enough in one year and not enough the next.

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report *Caring for the Earth* and its associated *Learners Guide* (UNEP 1992) regard this definition as ambiguous, and propose an alternative: "Improving the quality of life while living within the carrying capacity of supporting ecosystems". New Zealand's Resource Management Act (1991) is about sustainable *management*, not sustainable development.

Although there is much disagreement about how to interpret the terms used in these definitions, they are important in that they demonstrate the broad recognition that human society in its present form will not survive if we allow economic development to go on damaging our environment indefinitely. Among the goals of sustainable development are: protection of ecosystem functions; integration of economic and social policies; improvements in the quality of life, not merely income growth; elimination of gross poverty and excessive income inequality; and the development of a mechanism to ensure that all sections of society can be involved in decision making. As Rasmussen (1996:112) put it:

The bottom line below the bottom line is that [we must] recognise that the laws of economics and the laws of ecology are finally the same laws.....an expanding human economy that issues in a diminishing earth economy commits *suicide by increments* [my italics].

The "sustainability equation" offers a simple way to calculate the environmental impact (I) of human activities (P, population, C, consumption per head, and T, a measure of how efficiently the economy uses natural resources and processes wastes). The relationship between the four terms, $I = P \times C \times T$, can be used to generate some highly counter-intuitive predictions about the consequences of various changes in any one of the four (Jacobs 1996:27). For example if, over the next 50 years, the world economy grows by 2-3% and the world population doubles (both reasonable expectations from current trends), consumption would *quadruple* by 2050.

But such an increase in consumption might well be judged to endanger the ability of future generations to meet their own needs, so we must attempt to reduce the total impact of human activity over the same period, by say 50%. Then T would have to be reduced to one-sixteenth of present levels by 2050: that is, our technology and living habits would have to be 91% more efficient than they are now. "This may or may not be possible", remarks Jacobs drily. "It certainly will not happen without deliberate policy intervention".

A key point frequently missed by those who like to draw attention to the generally higher birth rates in developing countries is that the root of the problem of the total human environmental impact lies with the people of the industrialised North, simply because they consume so much more per head. The 57 million Northerners born in the 1990s - a mere 5% of the total global population growth - will be responsible for more environmental degradation during their lifetimes than the 911 million extra people born in the poor Southern countries during the same period (Athanasίου 1996:37). Another way of putting it is to point out that the 2.9 million people in Chicago (or the 3.6 million in New Zealand) consume about as much per year as do the 97 million in Bangladesh (Rasmussen 1996:39).

These are scarcely new facts, although not well known: as Athanasίου points out, “we are not, after all, always brave enough to face terrifying truths square on”. The clear conclusion is, therefore, that responsibility for working towards sustainability lies very heavy on Northern peoples. We are the only ones in a position to do it, and we *could* do so without risking our own survival, by reducing our often excessive consumption. As the old saying has it, we should live more simply, so that others may simply live. Even more importantly, we must increase our efficiency by learning to understand ourselves as part of nature’s “cradle-to-cradle” community life. The phrase, a deliberate contrast to the usual human way of thinking of a life as ending in the grave, was coined to emphasise that in nature the “end product” of one process is never an end but a beginning of the next process - the waste products and carcasses of one species are resources for the next (Hawken 1993, Rasmussen 1996:323). But will it happen? I doubt it.

The challenge of learning to live within our limits is not just a matter of calculating the resources we can each use; it is also a challenge to society and to individuals to overcome the materialistic attitudes and values which are responsible for the over-consumption and environmental damage in the first place. The prospects of the people of any Northern democracy achieving such a heroic level of self-sacrifice in their own living standards in order to assist the poor of the South seem remote. Intellectually, we may be able to agree that it is in our own best interests to do so, but in practice, the chances are slight to zero. Even changes that are urgently needed to improve conditions in our own environments are resisted. Why should this be?

Certainly, all arguments of the form “if everyone co-operated to recycle bottles/organise car-pools/avoid wasting water/ate less meat/refused to buy eggs from battery hens” (or whatever other personal sacrifices are seen as needed to do

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good in the world) are bound to fail. The contradictions between private benefit and public good are all around us. For example, Athanasiou (1996:42) points out that, even though European cities are clotting with traffic, no amount of analysis of the benefits of public transport negate the facts that *people want cars*, and the freedom and social status associated with them, just as they want beef, TV and the good life generally. The threat to the economics of running a private vehicle which arose during the Gulf War, and which might have made public transport or alternative fuels more attractive, merely demonstrated that Northerners would “rather fight than switch” (ibid: 24). The kind of radical overhaul of economic policy that Daly and Cobb, and even more so Hawken, are calling for would require a social consensus and an act of collective will and determination totally unprecedented in peace-time history. Many thoughtful academics I have asked about the chances of this happening (W.D. Hamilton, John Gray, Robin Dunbar) do not believe it is possible.

The reason is that the changes required strike at the core of human behaviour. The transformation of personal values required to accept a less materialistic life style is a matter of education and spirituality, not economics (Granberg-Michaelson 1992:49). But all the while economic advantage as defined under the prevailing paradigm remains the conscious governing motive defining rational behaviour in our society, and ignorance of our evolutionary background prevents analysis of our unconscious attitudes, no such transformation is likely.

Statistics bear out this rather gloomy prognosis. In a 1993 study of consumer attitudes in Germany, quoted in the report *Towards a Sustainable Europe*, G. Scherhorn identified four distinct sets of lifestyles among the German population, which the editors of the report considered would probably be representative of trends in other European countries as well (Friends of the Earth Europe 1995: 202). Only one group, comprising 20% of the population, were considered to be both aware of environmental and social problems and also prepared to take responsibility for doing something about them. These people tended to have a high income and education, and to be what Scherman called “post-materialists”, ie they had developed independent personalities and a comprehensive set of intrinsic values, so did not depend on material assets to provide the security and self-esteem that are the usual pre-conditions for the ability to appreciate the natural environment.

The other three groups were all labelled “pro-materialists” and classed as unlikely to take responsibility for either social or environmental problems, because they were entirely materialistic in their outlook (25%), or believed they could achieve a high level

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of material welfare without paying the price in environmental damage (30%), or were totally apathetic (25%). The fact that these pro-materialists comprised about 80% of the population means that, as the editors well realised (ibid :203), an immediate change in life-style and values is highly improbable - even in Germany, long considered to be one of the most environmentally aware countries in Europe.

To understand the reasons for the apparently irresponsible attitudes documented by Scherman, we must look more closely, first at why the management of common-pool resources (including most environmental goods) is particularly difficult (S.5), and then at what evolutionary biology can tell us about the nature and sociality of humans (S.6).

5 SHORT-TERM ECONOMICS: THE TRAGEDY OF UNMANAGED COMMONS

Almost all the important aspects of the natural environment which are at risk in New Zealand are resources common to all New Zealanders - rivers²², lakes, groundwater, air, endangered species, biodiversity, national and forest parks, leasehold tussock grassland, offshore islands, inshore fish and so on. So also are many of the human creations of the social environment that must be managed wisely, such as access to taxpayer-funded civic institutes, art galleries, health care and education. On the wider scale, there are other forms of resources common to humanity in general, such as ocean fisheries, whales, the ozone layer, Antarctica and so on. In order to appreciate why the well-meant admonitions of green activists are so often ignored, it is necessary to consider the special problems of managing common property.

5.1 The problems of common property management

There is a continuum of types of property, ranging from *private property* (as in the exclusive possession of one's own house) to *no property* (as in the open oceans and outer space). In between there is *common property*, where the rights of access, possession or exploitation are shared by persons in common with others. These rights may allow unlimited exploitation for those in a specified group, as in access to television broadcasting by those who have paid their licence fees, or they may stipulate limits or quotas on each user, as in commercial fisheries: but in either case there is definitely no open access.

The resources that are commonly owned may themselves be of two kinds, which represent the extreme ends of a spectrum of competition for access (Keohane and Ostrom 1995). *Public goods* are those that yield infinite benefits, in the sense that additional use by A does not diminish the amount of benefit remaining for B. No matter

²² At least, they have been regarded as common property until recently. Current arguments over, for example, the claim of the Tainui tribe to ownership of the Waikato River, are stimulating new discussions on which resources should belong to all New Zealanders and which should be returned to the ownership of the historically dispossessed tribes.

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how many people photograph Mitre Peak and breathe the oxygen in the fresh air of Milford Sound, or observe the local weather forecasts, navigation marks and lighthouses, the amount of each available to the next person is the same, so there is no competition for them. At the other extreme are *common-pool resources* which offer subtractive or finite benefits - if A uses more, less remains for others. Competition for common-pool resources is real, and if extensive, they become affected by depletion, congestion or degradation - the net results of any form of use pushed to beyond sustainable limits. The Milford road, the car park overlooking Mitre Peak, the beach at the edge of the Sound, and space for tourist boats at the jetty are therefore all common-pool resources, even though the view of the Peak remains a public good.

The difference between public goods and common-pool resources is significant, because some resources change from one type to the other over time if their normal superabundance becomes threatened by human activities (for example, fresh water in the Auckland area was a public good until the local human population passed a certain density, but the cumulative destructive effect of over-use, waste disposal, fertiliser runoff etc has since made it a common-pool resource), and some vary with locality (oxygen becomes a common-pool resource in a closed environment such as a submarine or aircraft cabin). Public goods generally cause rather little environmental concern unless they make the transition to common-pool resources. The term "use" includes both taking resources out of an ecosystem and putting waste products into it.

The problem of managing common-pool resources can be stated as follows. Consider a group of people who are placed in a situation where they could mutually benefit if all adopted a rule of restrained use of a common-pool resource, such as petrol during the "oil shocks" of the 1970s. Game theory (S.6.4) helps to explain why, even though it is in all their interests to co-operate to conserve the supply, they will not unless everyone is made to do the same by some recognised agreement or external authority. All individuals acting severally have an incentive to maximise their private use of the resource and ignore the associated social costs, not because they themselves are especially greedy, but for fear that others will benefit from their restraint. If there are reasons for ruling out price as a factor to regulate use, then various sorts of rationing must be imposed - one solution introduced in New Zealand in the late 1970s was the "car-less days" scheme. Common-pool resources with open access, like roads, or fixed price, like basic foods, or no price, like biodiversity, cannot be controlled by market mechanisms, and neither does the market provide any incentive to protect public goods, for example to keep the oceans clean or protect the ozone layer. The inevitable result is that the aggregate use exceeds the renewal rate of the resource (Wade 1987).

Garrett Hardin (1968) long ago suggested that management of common resources is difficult under certain conditions, which unfortunately are quite usual. The argument can be illustrated from the example which gave us the word “commons”: the medieval idea of a village pasture. In that system, a number of people held joint ownership over a common resource, such as common pasture sufficient for 50 villagers. They all had equal rights of access or use, and each had the right to graze his own cow on the common. Hardin’s argument assumed that all the villagers made their own independent decisions, and that in theory there was nothing to stop Bloggs grazing two cows. His profit would be one whole cow, whereas his loss would be 1/50th of the damage to the pasture. If everyone made the same calculation, the total use of the resource would be bound to exceed the supply, and the pasture would inevitably become overgrazed. The result is what Hardin called *The Tragedy of the Commons* (a tragedy in the sense of being both bad and inevitable). It happens wherever people are free to privatise benefits while socialising costs; economists know it as the “free-rider problem”.

As many authors have pointed out, and as Hardin himself later acknowledged, this parable is a caricature of the way that real common grazing lands were managed in medieval England, and still are, in equivalent contemporary situations in, for example, alpine Switzerland (Stevenson 1991) and elsewhere (Ecologist 1993). In practice, there are always socially-enforced restrictions on this process, which even in medieval times had been developed by local agreements over centuries. In a small village everyone knew what everyone else was doing, and Bloggs’ self-interest would be immediately detected and prevented. But when those social restrictions against access to a common-pool resource are removed, and especially if personal dealings can be done in private, there is nothing to prevent the rational decisions made by the individual users each acting in their own best interests, and out of sight of all the others, from eventually damaging everyone’s interests. It happens all the time to other kinds of public resources held in common by much larger communities where social cohesion is weak or non-existent, especially in modern times, because Bloggs’ contemporary equivalents can conduct their calculations under a cloak of anonymity.

Therefore, the system Hardin describes is actually industrial-system logic in rural dress, with nature regarded as free goods whose use is regulated by the market. It is not real commons-logic, where shared resources are regulated by community decision (Rasmussen 1996:338). For all common-pool resources, Hardin’s parable should in fact be renamed “The Tragedy of the Unmanaged Commons” (Hardin 1994). But, where access is open, his description of the chain of events is valid, despite the

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misnomer, and the difference between an open-access system and a true commons, in which real authority rests with a real community, is all the clearer for the contrast.

Hardin's tragedy can be explained in terms of a classic Prisoner's Dilemma (S.6.4) by defining A as any given cattle herder and B as all the others (Boyd and Richerson 1985). The reward of mutual restraint (score 3) is unpredictable, and it carries risk that A might be one of the herders that is affected by the extra damage done to the pasture by someone else who does not share the benefit (so A gets the sucker's payoff, 0). The best possible reward available for A is for adding another cow (score 5), even though this reward is greatly reduced if everyone does the same and the pasture is damaged (score 1) than is the reward for mutual restraint (score 3). Under the (unrealistic) conditions specified by the standard, one-off game, in which all parties can be relied on to behave as individual egoists who are greedy and/or playing safe, all will betray the others and go out to the cattle market at once, and the result is inevitable system degradation. The key conclusion from a more general statement of Hardin's parable is that physics and biology ultimately set limits to the options available for moral and political life (Elliott 1997).

I have collected together the following examples of the tragedy of unmanaged commons, taken largely from modern New Zealand, and presented them in the form of three "laws" which I have labelled with three well-known names. The names are attached not because these individuals formulated these "laws" themselves, but because their actions help us to understand the general principles summarised by the "laws".

5.2.1 First form: Muldoon's Law. In management of a common resource, strategies that are individually rational can be collectively disastrous

Modern economic law practically deifies the rights of individuals to pursue their own best interests by any legal means (S.4), but at the same time it frequently fails to mitigate the effects of the result on the common-pool resources at risk. Those effects are likely to be bad for the population in general if the private, rational short-term strategies of *individuals* have *collective* consequences that are destructive over the long term. The most obvious examples concern the apparently unlimited common resources of the past, which were taken to be public goods until they were destroyed or irreparably damaged by individuals

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claiming their rights within the law of the time: for example, ocean fish, seals and whales, natural tussock grasslands and forests.

Muldoon's Law is irrelevant to the management of genuine public goods, but swiftly punishes communities that mistakenly or selfishly ignore signs of limitation showing that public goods are making the transition to a common-pool resource. The early pioneer settlers of Canterbury could discharge smoke and human waste into their environment without a second thought, but their descendants in Christchurch do not have the same freedom now that clean air and water can no longer be regarded as unlimited resources.

Muldoon's Law is especially likely to apply if the common resource is believed (truthfully, or through self-deception) by individuals to be an effectively unlimited public good, and who like the pioneers see no need for personal restraint, even though the supply of the resource is in fact limiting to the group as a whole. The classic example is that of the man for whom I named the process, the New Zealand conservative politician Robert Muldoon. His 1975 election campaign was based on a promise to implement a generous and unearned national superannuation scheme, funded by an unstated tax-based contract of mutual support between generations (the present workforce pays the retirement pensions of the present elderly on the assumption that they will get their own in turn when the future workforce does the same). The voters treated the national tax revenue as a public good, so they enthusiastically supported a measure that proposed to give everyone over 60 a generous share of it whether they needed it or not. Muldoon achieved his intended result (he was elected), but at the price of contributing - along with many other problems - to unintended, long-term damage to the New Zealand economy (Kelsey 1997: 24) and considerable inequity between generations (Thomson 1991).

These days it is very clear that no fisheries, forest resources or taxpayer funding is ever unlimited, and new regulations quite properly restrict individual access to them even though they are still common property. But we seem not to have learned the lesson; other forms of common resources are still subject to Muldoon's Law if they meet the basic conditions for its operation, which are (1) open access, especially (2) by very large groups in which individuals may act privately, and especially (3) if the long-term effect is actually very damaging while the people concerned believe, or convince themselves, it is not. Even normally honest people may be willing to cheat on a large business, especially if it is making a substantial profit, on the grounds that "they can afford it". The key point is that open access is appropriate only for a genuine public good offering non-subtractive benefits, like the view of Mitre Peak -

and even then, the access route to and amenities around the main view point are not public goods²³.

5.2.2 Second form: Berk's Law. The threat of damage to or depletion of an uncontrolled common resource increases its value and stimulates competition among free individuals to harvest it all the faster, regardless of the future

Commercial exploitation of uncontrolled natural resources (here, "uncontrolled" includes also "insufficiently controlled") is almost always disastrous. In the earliest pre-colonial period of New Zealand history, huge populations of breeding fur seals on the subantarctic islands were wiped out by commercial sealers between 1792 and about 1820 (King 1990:255). In modern times, such practices can be halted by legislation, although usually not until after prolonged public battles. For example, the orange roughy fishery is not uncontrolled, but the size of the remaining stock has been overestimated and the quotas have been too generous. Fishermen, faced with declining catches, only try harder. Why should this be so, since it must be obvious to everyone that unrestrained exploitation has the effect of killing the goose that lays golden eggs?

First, many resources increase in value as they become rarer, and increased value is usually sufficient in itself to guarantee increased competition for access. Second, if the resource is not properly controlled, for example if it is in international territory like the air or the ocean, open access and competition ensure that even if individual A holds back from exploiting the resource, others will not, so the stock continues to decline. A's restraint conveys no benefits, neither private nor public, so Berk's Law proceeds even if everyone can see what is happening. Third, the economic rule of present-value maximisation dictates that even a genuine golden-egg-laying goose should be killed if the interest earned by a private owner on the capital gained from selling the carcass exceeds the future value of the eggs (Daly and Cobb 1990:156) - and even if the community is thereby impoverished of the precious birds. Fourth, self-deception is a powerful ally of idiocy and greed in these situations.

²³ I do not intend to make unhelpful and unfair criticisms of individuals for contributing to Muldoon's Law; rather, to question the economic model that guarantees their rights to do so.

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Modern commercial exploitation is usually assumed to be more damaging than the hunting practised in traditional societies, for several reasons. First, and most significantly, there is no effective limit to the financial incentive that drives commercial hunting, which is a quite different process to subsistence hunting. Second, commercial hunters are not dependent on a particular resource for survival in the same sense as traditional hunters were - when the resource runs out they do not starve, because they can turn to other work even if it means moving or retraining. Third, the control of the group over the behaviour of individual members that was characteristic of the small, close-knit tribe and which is crucial for real commons management, has broken down in modern society.

But in fact the supposed contrast between modern commercial and traditional hunting may not be real, since the only forms of traditional exploitation that have survived to the present day are the ones which have proved to be sustainable over the long term. Traditional hunting of resources that were extremely sensitive to exploitation, such as that of the early Polynesian settlers on the moa in New Zealand, and of many other colonists on other island bird faunas (Quammen 1996), was in its time just as drastic in its effect as has been that of modern whaling and cod-fishing. On Easter Island, the people who cut down the last living tree must have known that it was the very last one, since the island is so small, yet powerful social forces made sure they still cut it (Bahn and Flenley 1992). At first, when the supply of moa and other birds seemed unlimited, there was nothing to prevent massive overkill; later, when Berks Law came into effect, there was nothing to restrain hunters driven by desperate hunger.

In *The Origins of Virtue*, (Ridley 1996) argues against the romantic idea that indigenous peoples are necessarily any better conservationists than Europeans: if they have done less damage in the past, that is because they have had less technology. He quotes (p. 223-4) Nicanor Gonzalez, the leader of a South American indigenous people's movement: "We aren't nature lovers....at no time have indigenous groups included the concepts of conservation and ecology in their traditional vocabulary". For example, the Kayapo Indians, given control over a 20,000 square mile reserve in Brazil, were soon enthusiastically selling concessions to gold miners and loggers. In other words, when other pressures are or were strong enough, and the resource fragile enough, Berk's Law can work just as well for primitive societies as for any other. Tim Flannery's analysis of the problem is aptly entitled *The Future Eaters* (Flannery 1994).

If the "resource" is valuable to some members of the community but regarded as a pest by others, unrestrained commercial hunting can serve the interests both of the hunters

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personally and also of the common good. For example, for about fifteen years after the discovery, in about 1970, that it was possible to shoot deer, tahr, goats and chamois from helicopters (Caughley 1983), the intensive exploitation of these animals over huge areas of inaccessible high country in New Zealand had a devastating effect on their populations and a net beneficial effect on the native vegetation. That was not the intention of the hunters, but the effect was positive anyway. Far more often, the resource is valuable to everyone, and unrestrained exploitation by a few deprives everyone. I named this idea after the common description of an idiotic profligate as a "berk".

So why do people not co-operate to stop Berk's Law progressing, either in the past to prevent the extermination of an open-access resource such as the fur seals, or in the present to manage the current environmental crisis? Because, as game theory so clearly demonstrates (S.6.4) it would be irrational for A to hold back from using the resource if there is nothing to prevent B, C and all the rest from taking it if A does not - everyone else gains at A's expense, and the resource continues to decline faster and faster. When people convince themselves that the resource is bound to decline anyway, they become all the more determined to be sure of getting their share.

The classic examples of this process are the nineteenth century collectors of rare birds in New Zealand, who knew very well that many species were declining into extinction, and that their activities accelerated the process, and yet continued to collect them in huge numbers:

Since the species were bound to die out, then obviously specimens should be taken while they were still available. Buller liked collecting - the thrill of acquisition, of having the lovely, rare, feathered specimens. As their rarity increased, their value in the eyes of fanciers like Buller and Rothschild soared (Galbreath 1989: 207-8).

In modern environmental decision-making, the influence of self-deception is both widespread and deeply puzzling to philosophers. The deep questions it raises about the origins of morality and of self-deception in human affairs are discussed in S.6.6.

5.2.3 Third form: Bolger's Law. Individuals will tend to resist restriction of private access to common resources, even to protect the long term interests of the community

Recent New Zealand governments have inherited the huge national debt created partly by the operation of Muldoon's Law during the decade from 1975. The Labour Government elected in 1984 introduced a massive structural adjustment programme, driven by free-market economic ideology in its purest form. It included a surtax on the generous payments of Muldoon's pension scheme, such that everyone still received it but those who had more than a minimal level of other income paid back part or all of their national superannuation in tax. This measure met predictable outrage from voters, who thought of the national tax revenue as an effectively unlimited public good and resisted the surtax as an intolerable infringement of their personal right of access to it. During the general election campaign of 1990, Jim Bolger promised to repeal the detested surtax, but once safely in office as the next conservative PM, he merely replaced it with an even more draconian income test (Kelsey 1997: 287). People have remembered and resented Bolger's betrayal with amazing ferocity, even though most can also see that Muldoon's original scheme was unsustainable in the long run, and that therefore it was in everyone's interests that something be done about it. Rather similar arguments have been heard since the originally very generous payments of the New Zealand Accident Compensation Commission have had to be curtailed.

Another equally graphic illustration of Bolger's Law in operation was played out in Rotorua in 1987. The city stands above a large but limited reservoir of underground geothermal fluid, which supplies the famous geysers and other geothermal features of the region. The very important local tourist industry is quite directly influenced by the health of the geysers, especially Pohutu - the largest geyser in the Whakarewarewa field, itself the last of New Zealand's five known active geyser fields still remaining in its native state. In the late 1970s, concern was rising about the decline in Pohutu's activity, due to excessive withdrawal of the geothermal fluid through the many private bores in the city. Eventually, in 1986 the Government took emergency action, and implemented a progressive programme of bore closures. In 1987-88 the programme accelerated to include compulsory closure of all private bores within a 1.5 km radius of Pohutu, plus all Government wells in Rotorua. It was obviously in the interests of everyone in the local community to protect the tourist trade, but nevertheless the owners of the private bores were outraged. There were large public protests, resistance (to the extent of attempting physically to prevent access to the privately-owned bore-heads), and legal challenges to

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the Government. Subsequent monitoring of the aquifer water level and pressure, and the activity of Pohutu, showed significant improvements attributed to the closures, vindicating a Government decision considered by many at the time to be “harsh, draconian and un-necessary” (Grant-Taylor and O’Shaughnessy 1992).

Examples of Bolger’s Law could easily be multiplied, because the restriction of private access to public resources is becoming more and more necessary as human pressure on the environment increases. In both New Zealand and the western states of USA, large areas of publicly owned grassland have been leased to private farmers for pastoral grazing since the last century. When animal pests (rabbits in New Zealand, and coyotes in USA) threatened to make such farming uneconomic, many farmers demanded removal of the pests at public expense, resisting any suggestion that the public benefit might be better served by a policy of rethinking the whole idea of uneconomic farming on public lands. Small local communities often protest when their long-established access to the free natural cleansing powers of the sea is ended, and replaced by compulsory payments (via higher rates) for sewage treatment. Perhaps the ultimate example is the one-child-per-family policy in China, in which the public resource at stake is living space and a sustainable life for the existing population. In the long term that can be protected only by restricting the number of new individuals entering into it, and that in turn can be achieved only by drastic state interference into the private lives and decisions of individuals. One does not have to experience the stresses of life in China to agree that the policy, or something like it, is necessary; but at the same time one does not need to be a Chinese to sympathise with the individuals who resist it.

A more dangerous form of Bolger’s Law operates when the individuals resisting restriction of access to the resource are also the ones who make the rules. They are then in a position to do a great deal of damage. In highly stratified societies controlled by a relatively small elite, such as in eastern Europe under the communists, one or a few powerful people can manipulate the government institutions that keep social arrangements intact even when the cost is obvious and there is progressive environmental deterioration (Rasmussen 1996:42). Ironically, among the worst examples of this comes from the other side of the political divide. In the early days of the Reagan administration, the Secretary for the Interior James Watt refused to restrict commercial access to natural resources in US because he believed the Lord was liable to return at any moment, so it would be pointless to implement environmental protection that could hamper US industry in the meantime (Swadling 1989).

In effect, maldistribution of power and social inequality permit powerful forces to benefit without hindrance at the expense of both the people and the resource until it is too late. C.S. Lewis made the same point, decades ago, when he commented that what we call human power over nature is actually the power exercised by some people over others, using nature as a tool. The Marxist version is even more succinct: “power over nature becomes power over people” (Barbour 1997: 144). Once again, the theme emerges: justice and equality are essential pre-requisites for any future protection of nature – down to, and including, the level of local authority policies about litter (S.11.1.2).

5.3 Theories of collective action

Economists refer to the tragedy of unmanaged commons as a “market failure”, reflecting their customary assumption that market control of public assets is or should be the norm (Hartley 1997). Market failures are usually caused by uncontrolled “externalities” - profits or losses not accounted for in the market model - and corrected by vesting of property rights, or by institutionalising arrangements for “internalising the externalities”. These seldom work as intended – and anyway the free-market philosophy has limited application to many forms of public assets. So it is worth emphasising that there are, broadly, three alternative strategies under which the usage of a common-pool resource may be regulated. All involve the co-ordination of the individual decisions of the users by various degrees of agreement or coercion, but the circumstances favouring them vary. The moral challenge is to find ways of making the coercion as painless, as humane and as unobtrusive as possible (Elliott 1997).

5.3.1 Privatisation

In a private environment under individual or family ownership, the owner has freedom of control over the resources it contains. The effect of privatisation is to internalise the benefits of good management, which therefore adds motivation for improvement policies including, for example, the reduction of overuse. Rational management is in the user's (ie, owner's) own best interests, so most property owners are careful about keeping up with maintenance and preventing damage. Most of the benefits of access to private resources are internalised to the owner, although they sometimes also have a side benefit for the public; for example, any passer-by can enjoy the sight of a well-kept garden or farm supporting beautiful flowers and wildlife. Conversely, the costs of bad

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management are borne directly by the user. The net result is that benefit and cost are both significant when it comes to making management decisions, and ideally they should be more or less balanced - provided the owner is committed to long-term dependency on the resource, and cannot abandon it for another one when it is damaged.

When the owner depends on the resource, the rights, responsibilities and survival value of ownership become linked; therefore private resources are generally well managed, which ideally should encourage good conservation of resources over the long term. The eighteenth-century enclosures of common land, and the huge advances in agricultural productivity that followed them, were driven by the insistence (not necessarily explicit) of progressive landowners that the benefits of land development should be internalised, ie should benefit only the owner and not the labourers. The disadvantage of private ownership is that it leads to gross social inequalities of benefit, and eventually to envy and injustice. After the enclosures, the productivity of English farmland soared - but the improvements benefited only the few who had secure private ownership of good farmland: a far greater number of labourers were dispossessed of all access even to communally owned land, and in time fell into great poverty (Ecologist 1993: 25-6).

Conversely, in open-access public environments such as a national highway system, all individual members of the group have at least theoretical freedom of access to the resources owned by the group. Rational management is certainly in the group interest, but it is not the responsibility of any individual user. The benefits of access go to *individual users*, while the costs of bad management are *divided between all users*. The net result is that the rights and responsibilities of ownership are divorced; and since the benefit from exploitation is much higher than the cost, long-term environmental damage becomes a real danger. The main advantage of public ownership is that it allows social equality of benefit (or loss) in the short term.

If private resources (such as land, houses, and businesses) are usually better managed than public ones, because of the natural self-interest of the owners, the question arises: could self-interest help to conserve public resources too? Adam Smith, in *The Wealth of Nations* (1776) promoted that view in his famous declaration that an individual who "intends only his own gain" will be led by, as it were, "*an invisible hand*" to promotethe public interest" (S.6.6.1). Smith's metaphor was memorable, and although it was mentioned only in passing, the message it so neatly encapsulated suited powerful landowners and politicians, especially those to the right of centre, so it was and still is widely believed. Hartley (1997) applies the modern version of the same logic to the management of conservation lands in New Zealand. But is it true?

In practice it all depends on the scale of the operation and the number of people involved. Muldoon's Law (S.5.2.1) illustrates why unrestricted self-interest may manage private resources well, but it manages communal resources badly, unless they are owned and used by a very small social group all of whose members are very well informed about what all the others are doing. How small a group can effectively shortcut Muldoon's Law?

Hardin (1993:266) quotes the collective management of land by the Hutterites, who live in religious colonies of between 60 and 150 people. As colonies grow, more and more members become "drones", defined as those who attempted to maximise the only personal luxury allowed in that society, leisure time. In a colony of below 150 members, close social scrutiny makes shirking difficult, but in larger ones it becomes easier. Hutterite colonies are therefore deliberately split up when they exceed that number.

Privatisation also tends to rule out certain forms of activity that might be in the common interest but whose benefits cannot be internalised. The classic example is the lighthouse (Ridley 1996:102): who will pay for a lighthouse when the light is free to all users? The same argument applies, pro rata, where the services needed are not free but still uneconomic, such as those of rural post offices and buses. Rasmussen (1996:326) asks: "How efficient and realistic is it to continue with..... 'dumb design', that is, design that never asks what the health of ecosystems and human communities require and that results in horrendous waste and injustice?" Under the prevailing free-market model that dominates world finances at the moment, the logic of privatisation answers: If it makes a profit, it's efficient and realistic.

Regardless of all criticisms, the privatisation model will not go away. After all that has been said about the failings of the free market (S.5), any suggestion of extending it in order to advance the interests of conservation must seem completely illogical. But Hartley (1997) argues the case at great length, and specifically in the New Zealand context. He concedes that, in some cases at least,

it is undeniable that externalities or a positive demand for public goods can make it extremely difficult, if not impossible, for markets to attain the *maximum conceivable* benefit from the available resources [his italics]. However, political and central planning approaches to resource allocation have their own limitations and failures (p. viii).

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The problem, says Hartley, is not failure of markets, but *insufficient markets*. Control of common resources by a management agency on behalf of others via parliamentary legislation (the usual pattern, eg of the New Zealand national parks by the Department of Conservation) raises questions of management accountability and incentives. It also encourages people to find ways of transferring to others the costs of meeting their aims – for example, by exaggerating the demand for, and the benefits of, politically provided goods and services. In a clear reference to conservation activists, he specifically singles out for criticism the claim that the environment is sacred, or otherwise incommensurate with commercial activities, which he sees as a ploy used to pre-empt alternative resource uses. Because conservation is a costly activity, users of conservation assets should be required to pay the full cost of their claims on valuable resources, he says. For example, the present policy of providing free access to conservation areas reduces the cost of operating a commercial eco-tourism venture and discourages development of full-cost private resources for that purpose. “If DoC were a commercial organisation, its current pricing policies would be illegal” (p. x). Methods of controlling demand other than by prices, eg by refusing to provide easy access to remote sites of interest to potential tourists, are inefficient.

By contrast, Hartley says, all these problems could be resolved by intelligent and creative use of property rights, which has great potential to aid the conservation of habitats and species and encourage sustainable resource use. The example he gives is a familiar one:

The disappearance of the moa in New Zealand provides another example of the disastrous effects of lack of private ownership of valued resources (p.xii).

It is hardly any surprise to note that Hartley’s analysis was published with the backing of the New Zealand Business Roundtable. But the painfully obvious lack of consideration of any system of thought other than market economics has led Hartley into many errors of judgement about conservation problems, including:

1. His questioning of the accountability and incentives of public-service conservation managers betrays total unfamiliarity with the motives, integrity and attitudes of the people who actually carry out those responsibilities.
2. The first national park in New Zealand (Tongariro) was gifted to the nation in 1887 by its Maori owners, led by Te Heu Heu Tukino, precisely *because* the sanctity of that environment was to them a deeply held conviction, not a ploy in a political argument. If the gift had not been made then, for reasons which are totally

incomprehensible in Hartley's view, no conservation agency could afford to buy the mountain at today's market prices.

3. The ideal of free access to national parks goes back to the very foundations of the earliest national parks in US and Australia in the 1870s, whereas the free-market model in its present form dates only from the Bretton Woods conference of 1944.
4. In some countries, the idea of charging park user fees has been reluctantly accepted in areas of very high potential use, mainly because unrestricted access would cause damage to the natural values being protected, not for economic reasons – user charges can easily cost more to collect than they bring in.
5. The argument that the extinction of the moa was due to “lack of private ownership” is simply absurd. The moa of any given area could only be hunted by the tribes that claimed communal ownership of that land, and they disappeared because, like all large endemic birds, they bred very slowly and were extremely vulnerable to any sudden increase in mortality (King 1984).

The then Minister of Conservation, Nick Smith, rejected Hartley's recipe for managing New Zealand's conservation lands as “based on greed and exploitation” (*Forest and Bird*, February 1998, p. 4). But within months came the next round of arguments in the same vein: a critique of the Resource Management Act, commissioned by the Minister for the Environment and written, in provocative style, by an independent consultant, Owen McShane. The call for public submissions on McShane's report received 750 responses (Anon 1998). The pressures exerted on public assets by economic interests, disguised as instruments of the common good, seem certain to continue indefinitely.

5.3.2 Regulation

Not all common-pool resources can or should be privatised. The next alternative, therefore, especially where increasing scarcity of resources is bringing Berk's Law into action, is regulation. Hardin (1993) is one of the best-known advocates of hard-headed state interference in even the most sensitive personal decisions, such as family planning. As he points out, one of the most pressing of the world's problems is over-population. Some authorities maintain that it is the only real problem, and all others are consequences of it. Others disagree, on the grounds that it is not the actual numbers of people that matters but their lifestyles, particularly in the highly consumptive Northern world (S.4.2). As the American attitude at Rio clearly demonstrated (S. 2.2), people are not likely to take kindly to regulations suggested by other cultures affecting their family

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lives or standards of living. Yet, says Hardin, such regulations will soon be seen as inevitable - preferably in the form of "mutual coercion, mutually agreed upon".

In one of his best-known metaphors, Hardin likens individual nation-states to lifeboats, some of which are too overcrowded to stay afloat. But, he asks, if you are in a lifeboat that can carry 50 people, and 50 more are in the water, what do you do? If you take in all 50, then 100 will drown when 50 might be saved. If you take in 10, you have to decide which 10, and what to say to the other 40. If you take in none, you will be safe but you still have to face yourself later. If you and any other altruists offer your places to others, then all altruists will drown and the total surviving remains the same - all of them more selfish than the average. (This is a particularly distressing conclusion to Christians schooled in the virtues of self-offering love). In a strictly enclosed system, the dilemma is insuperable. Hence Hardin concludes

To couple the concept of freedom to breed with the belief that everyone born has an equal right to the commons is to lock the world into a tragic course of action (Hardin 1968).

Hardin quotes with enthusiasm Kenneth Boulding's idea that in a future world, girls will be issued with tradeable child-bearing certificates when they reach 15, and those who produce more children than they have certificates for will be compulsorily sterilised (Hardin 1993: 273). The chances of any such scheme being introduced into any Northern democracy in the foreseeable future seem negligible. It would be not only politically impossible, at least until the effects of the environmental crisis become a lot more obvious than they are yet, but also counter-productive. Experiments show that people's willingness to exercise self-restraint is affected more by their communication with each other - that is, by whether or not they live in a functioning community - than by the prospect of punishment. "Covenants without swords work; swords without covenants do not.so much for Hardin's plea for coercion" says Ridley (1996: 240).

Wherever the main or only form of communication possible is personal, the optimal size for a community is up to about 150 (Hardin and Baden 1977). This rule has applied throughout human history until the last century or so. However, now, in the age of electronic communications, much larger communities are possible that could have the same effect, and they might favour greater degrees of mutual regulation in future. The advent of the Internet might improve the prospects of widespread consultation on and mutual agreement about matters of public good within very large communities. If not, or for resources that are too widespread for management by any form of personal

involvement, Oye & Maxwell (1995) offer a moderately optimistic view of the prospects of developing rational environmental policies by imposing “systems of regulation and compensation that bring about convergence of narrow self-interest and the common good”. Of course, where the interests of the individual and the group coincide, regulation need be only minimal: the more they conflict, the tighter the regulations have to be to protect the common good. Oye and Maxwell therefore distinguish two different kinds of regulation.

In what they call “Stiglerian” situations, the desired convergence of self-interest and common good is a by-product of regulations constraining competition, limiting entry by new competitors and encouraging monopolies. Because the benefits are conferred on a few and the costs diffused across the many, the few who are regulated benefit from regulation: they lobby for it, and the system, once established, is stable. For example, the Montreal Protocol that banned the use of CFCs created a market for substitute chemicals in which DuPont and ICI had a market advantage, so, after opposing regulation on principle for as long as they could (Athanasίου 1996:64), these companies strongly supported the regulations which benefited both their own commercial interests and the common good. Similarly, the phasing out of unleaded petrol created a larger market for the higher-profit unleaded petrol; the banning of DDT, a cheap and easily-made chemical produced independently in many Southern countries, promoted a move to more specialised substitute chemicals which are more difficult to produce and so favoured the interests of larger (Northern) companies; and restrictions on new housing developments and enterprises such as salmon farms favour the owners of existing houses and installations.

On the global scale, there are few effective international authorities capable of controlling access to or use of global commons in order to force a Stiglerian solution. The action of the UN/US during the 1991 Gulf War, portrayed as a means of protecting the sovereignty of Saudi Arabia and Kuwait, was very obviously driven by the self-interest of the Northern powers, which could not tolerate the idea of Saddam Hussein gaining control of the oil wealth of the friendly Arab states. All the same, the congruence of interests of the UN/US and the Saudis/Kuwaitis achieved the desired effect, perceived to be in the cause of the global common good, of terminating Hussein's territorial adventure into Kuwait. Less dramatic forms of UN regulation are effective, but experience confirms the comment of the World Commission on Environment and Development, that “hammering out an international consensus [on managing the commons]....is a huge task requiring time and patience” (Brundland 1987: 286).

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In "Olsonian" situations, the benefits of regulation are diffused across the many while the costs are borne by a few. No natural convergence of interests is possible, so it must be created artificially. Those regulated will often protest, and the only way to achieve stability is to arrange for compensation from the many to the few. Regulations that are seen to be unfair can be unstable, although if the compensation is substantial it can be decisive in achieving a solution. In one case,

the Hokkaido Electric Company paid 300 million yen to one of four small fishing co-operatives opposed to the construction of a nuclear power plant. Not surprisingly, payments of this magnitude diminished local opposition to the plant (Oye and Maxwell 1995:215).

Loggers and farmers can be relied upon to oppose restrictions on cutting rights imposed to protect endangered species. In one well-known New Zealand case, at Pureora in 1978, payments for logging contracts lost or broken by government directive (but only as a result of determined protests by conservationist groups) were reported to have cost NZ\$7 million - a substantial sum at that date (Wilson 1982, Wright 1980). In Britain, under the Wildlife and Countryside Act 1981, taxpayers compensate owners of private resources for not implementing developments on their own land that would benefit the owners but be detrimental to the public good (Moore 1987). The idea is laudable, but, as any cynic might predict and as Oye and Maxwell observe, the supply of compensation may generate its own demand, and encourage deliberate deceptions by local landowners who may not have intended to do the disputed developments at all but threaten them as a cheap means of extracting compensation.

Olsonian compensation does not seem likely on the global scale, at least not as yet, but a form of it has certainly been suggested, based on tradable rights. For example, one suggestion is that every country should have only a certain number of rights to emit pollutants or greenhouse gases such as carbon dioxide, and therefore the rich North, which pours disproportionately more carbon dioxide per head into the global atmosphere, should compensate the poor South for taking up the South's allocations as well as their own (Richards 1991). Such allocations, based on already-recognised population data and territorial authority, would give the South an unfamiliar and welcome bargaining advantage based on justice rather than on aid, reverse the present flow of wealth from South to North, and go far to alleviate the South's unbearable burden of debt. Needless to say, Richards' idea that, "for the first time in history the disinherited may have a grip on the powerful" would be fiercely resisted by the North, and - as amply demonstrated at Rio - it has so far proved impracticable to impose on any wealthy

democracy. On the local level, regulations such as “user-pays”, which attach replanting obligations to forest cutting rights and clean-up obligations to mining permits, are small steps in the right direction.

Unfortunately, systems of regulation imposed by the state are not only expensive to administer, but they have been known to misfire, especially if they take control of a resource out of the hands of a local community and put it in the hands of an inefficient government bureaucracy. An example recounted by Ridley (1996: 236) is the action taken a few years ago by many African countries to nationalise their wildlife and game reserves, on the assumption that nationalisation would be the best way to protect this common-property resource from poachers. But the actual effect was that local farmers suffered damage from government-owned elephants and buffalo, without having any balancing incentive to look after the animals as a source of meat or tourist revenue. The decline of African elephants, rhinos and other animals outside the parks was, says Ridley, a tragedy of unmanaged commons caused by nationalisation. But the situation can be rapidly reversed whenever title to wildlife is re-privatised to local communities and hunters have to bid for the right to shoot game. Then the villagers change their attitudes to the now-valuable game on their land. The acreage of private land in Zimbabwe devoted to wildlife has increased from 17,000 to 30,000 km² since the government granted title over wildlife to landowners. Likewise, Nepalese irrigation systems run by the state or by aid agencies are less efficient and less equitable than those run by the villagers themselves (Ridley 1996:237).

Such cases illustrate, says Ridley (1996: 262-3), that where authority replaces reciprocity, the sense of community fades, so heavy government makes people more selfish, not less. Therefore, systems of regulation, however tempting, are often not the best answer, for a reason he summarises in a few words: “Ecological [and economic] virtue must be created from the bottom up, not the top down” (ibid: 246).

5.3.3 Collective action

The drawbacks of both privatisation and imposition of regulation by an outside authority invite closer inspection of the third means of managing a common property, by genuine collective action. The possibility of long-term success in such action is often dismissed, largely because of the huge and continuing influence of Hardin’s “Tragedy of the Commons” parable, despite criticism (Vink and Kassier 1987 quote

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one reviewer as saying that “it would be difficult to locate another passage of comparable length and fame containing as many errors”!), and of similar theoretical models such as the Prisoner’s Dilemma (Stevenson 1991, Wade 1987). Yet empirical observers of societies where common-pool resources have been successfully managed for centuries, such as Switzerland, India and South Africa, point out that theoretical models simply do not explain reality. Wade therefore set out to ask what conditions favoured, or denied, successful collective action.

Unsuccessful

At one extreme, he says, we should not expect to find any system of restrained access organised by the users themselves when:

1. there are too many independent users;
2. the boundaries of the common resource are unclear;
3. when the users live in large groups scattered over a wide area;
4. when undiscovered rule-breaking is easy.

Such conditions assisted the virtual extermination of seals and whales in New Zealand waters during the late eighteenth and early nineteenth centuries (King 1990). The same can be said with reference to the management of social resources at the nearer end of the historical scale, the abuse of taxpayer funds as summarised by Muldoon’s Law described above. “In these circumstances”, says Wade, “degradation of the commons can confidently be expected as demand increases, and privatisation or state regulation may be the only options”. But both of these have their disadvantages. So are there any other alternatives?

Successful

Wade (1987) lists a number of definable circumstances under which self-organisation by user-groups to manage a common resource can be successful. I have illustrated Wade’s list with New Zealand examples.

1. The resource is relatively small and located within definable boundaries, but the technology to privatise it (e.g. by fencing) is expensive. In New Zealand the Himalayan tahr (a goat-like mountain animal) and sambar (a large Asian deer) are introduced game animals much admired by hunters, and both occupy reasonably

well-defined but unfenced ranges on public lands. The hunters who value them lobbied against excessive control of tahr by the Department of Conservation in the late 1980s, and organised a voluntary ban of sambar hunting when their populations fell too low in 1982 (extended indefinitely when it expired in 1987) (Hughey and Parkes 1996).

2. The users live close to the resource, depend on it for survival and understand about sustainable yields. The user group is small, clearly defined, democratic, with high mutual solidarity and a system for noticing and chastising rule-breakers, and has a leadership which benefits from good management of the common resource. In the Classic period of Maori culture in New Zealand, each of the many distinct tribes held their marine and forest resources in common ownership. The complex regulations of *tapu* controlling the harvest of shellfish, finfish, birds and timber (Best 1942: 132-5) were regarded as a matter of life and death to the tribe, taken so literally that early European visitors such as Marion Dufresne who ignored them were attacked in rational self-defence (Duyker 1994).

3. The state either does not exist as a separate institution, as in New Zealand before 1840, or it exists but does not interfere with legal forms of collective action, hitherto always locally-based. In the modern world, for the first time, awareness of environmental problems is international, and *global* collective action is now possible. One of the most successful forms of it ever seen has been the world-wide boycott on the trading and use of animal furs. The rationale of it was more to do with the prevention of cruelty to animals than the management of a common-pool resource, but it remains an impressive example of influential collective action driven by an intense emotional commitment and coordinated by world-wide communication. The consequences have been serious for New Zealand, where the Australian brush-tail possum, an introduced fur-bearing mammal, is a serious pest. The devaluation of furs on the world market has made trapping uneconomic, thereby removing one formerly important means of controlling possums. The international ban on whaling, though less successful, is more directly a reflection of world-wide public concern over a vulnerable common resource.

Where these conditions are met, collective action works. Some of the immense variation in effective forms of local authority over local resources, built up over the course of history in traditional societies, are discussed by Hardin (1977) and Ecologist (1993). The latter book, *Whose Common Future?* is a protest against the “paternalistic outsiders” and the webs of international power that run most

development programmes stimulated by the Bruntland Report - together with a passionate appeal for the restoration of genuine commons management.

Because the conditions favouring collective action are so variable, there is no guarantee that it will necessarily work in a given situation, any more than privatisation or state regulation necessarily works. The dismal frequency of degraded natural commons, such as despoiled forests, overexploited groundwater and depleted fisheries - not to mention social commons such as chronically overcrowded roads and vandalised public conveniences - shows only too clearly that collective action cannot always be presumed to be effective. It all depends on the circumstances. The scheme proposed by Wade (1987) emphasises only that the probability of descending into such anarchy or destruction is neither as strong nor as general as the theoretical models imply. His conclusion is that, where the circumstances may favour collective action to manage a resource, we should not be too hasty to reject it as an option, especially since it may be cheaper to implement and more stable in the long term than either privatisation or external regulation.

Which is the best option depends on the conditions, and most particularly on the size and mutual solidarity of the local community. Application of game theory can often help understand different people's reactions to a given scheme (S. 11.1.2). The only thing that all three management options have in common is that none of them will work without education, monitoring and social or legal sanctions to back up rules or collective agreements. This common factor is the main reason why the well-intentioned declarations emanating from Seoul and Rio have had no general effect. Proponents of the Fifth Mission Statement need to understand that before adding to the already massive world stock of useless green exhortations.

The ultimate challenge for the development of an environmentally responsible life style in the modern world is to foster a widespread congruence between personal and group interest, which is the basis of community responsibility or "public spirit". Achieving that congruence has always been one of the social functions of religion (Burhoe 1979). When a cultural story is widely accepted and regularly reinforced through rituals such as worship services, the group is seen to be more important than the individual. Part of the reason why community responsibility seems to be waning in the contemporary Northern world is that the traditional stories underlying Christian society have lost their influence on individual ideals and behaviour, and the more basic forces of human nature are freer than they were. An understanding of evolutionary biology helps to explain the consequences of this loss.

6 HUMAN NATURE

6.1 If there's a crisis, why are people ignoring it?

It is obvious that everyone ultimately depends on the resources that creation provides, and therefore everyone has an interest in ensuring that creation, and especially the part of it that constitutes the human environment, remains healthy. So why do the earnest exhortations of theologians and green activists so often fall upon deaf ears? As Brennan (1993:18,8) asked, "If we really desire to pass on the earth in good shape to our children, then why do we not act on this desire?...[why don't] decision-makers and policy analysts ... take account of our individual and corporate tendencies to tell ourselves comforting stories that help us live with self-deception and weakness of will"?. These are among those simple questions to which there are no simple answers, but a lot of clues can be found in recent advances in evolutionary biology.

First, well-intended exhortations must be realistic. There must be some irreducible minimum of damage to creation, simply because of the sheer size of the human population that it has to support. No-one, least of all any Christian, is seriously suggesting a deliberate campaign to kill off surplus people; those who already exist are accepted to have the right to continue to exist. Therefore the problem of caring for creation is confined to (a) mitigating the burden of supporting the present human population, and (b) minimising the consequences of that burden for future generations. There is plenty of room for improvement in both (and for suggestions that there should be a third aim, (c) to progressively reduce the size and impact of the global population), but all such ideas meet some formidable obstacles.

These obstacles are partly in the nature of things. For example, the energy equations of plant productivity are much the same in all ecosystems, but energy moves faster through some plant communities than through others. Much of the primary productivity of a forest is locked up in long-lived and inedible plant material, such as trees, whereas the primary productivity of a field is short-lived, rapidly replaced and easily converted into bread or meat. Therefore, it is simply impossible to support as many people on the products of a forest as on the products of open grassland. That is the reason so much forest has been cleared, from historical times onwards, and why

there is a practical limit to the proportion of forested land that any populated country can afford to reserve – even though many endangered species can live only in forest.

But such purely technological matters are minor considerations besides the really daunting obstacles to conservation imposed by the nature of humans. Even given the very large global human population, caring for creation would be technically possible, even though difficult, if only everyone could agree on what needs to be done *and cooperate to do it*. The fatal dilemmas that dog the best intentions of WCC and the international conservation movement alike arise from the fact that our *individual* attitudes and behaviour often sabotage the *collective* decisions we need to make to implement the wise management of our common environment on a sufficient scale. That alone makes caring for creation a *moral* issue, one that transcends the objective discussion of how ecological damage to our environment arises. Sustainable development is *not* “business as usual with green bits” (Lawton 1994); taking the concept seriously forces people to realise that they have to make agonisingly difficult *choices*. Ecological morality is a matter of weighing up the consequences and significance of one’s own actions, which can be labelled as good or evil in terms of their effects on other people, countries, biota or ecosystems, and then making conscious, personal decisions:

You either decide that most human beings in the developing world can never own cars, or you have to imagine a future in the developed world with many fewer cars – in fact a developed world with rather less of most things...so what will you give up? Who, in western democracies will vote for less, not more? (Lawton 1994).

In turn again, those choices presuppose a clear idea of what constitutes morality, what distinguishes good and evil, and where these concepts came from. For the Christian biologist, that means understanding evolutionary biology and the relationship between the evolutionary and the cultural stories of humankind.

The main outlines of the current theory of evolutionary biology are standard knowledge, but recent advances are frequently misunderstood, and when it comes to applying them to human life there is plenty of room for different interpretations.

1. The most important of these is the debate about the levels at which natural selection works within human social life – to what extent are contemporary humans subject to its workings? Are we simply the “robots” of Dawkins’

provocative metaphor, the product of unconscious genetic mechanisms over which we have no control - or, worse still, the unknowing hosts of parasitic memes that manipulate human behaviour to serve only their own interests - or do we have real choices? Can humans consciously deflect the processes of natural and cultural selection in order to develop and practice public virtues? S.4 has illustrated some of the reasons why we need to combat the damaging assumptions about the self-interested behaviour of individual *Homo economicus* which are the basis of the free-market economic system that has governed western society for the last 200 years. Unfortunately, biology has some sobering things to say about the extent to which we can hope for help from human nature on improving human attitudes to the global environmental crisis.

2. A second, equally important debate is about reductionism. The main problem of biology is to explain how so many complex structures have been built up in the world. Dennett (1995) distinguishes two kinds of theory, illustrated by two mechanical metaphors. A “crane” is an openly understandable, scientifically testable theory, such as evolution by natural selection. A “skyhook” is a non-testable hypothesis appealing to outside help, either from aliens or from God. In Dennett’s view, critics of natural selection (mostly non-scientists) are unable to give up hope in skyhooks because they cannot quite believe that cranes can do the job unaided. Among scientists, he distinguishes between “greedy reductionists” and “good reductionists”. The greedy ones try to do without *both* skyhooks and cranes, ignoring intermediary mechanisms including natural selection and descending immediately to physics. The good ones are opposed only to skyhooks, and their work is the basis of all modern science.

As an essential context for the arguments I present, especially in S.9.5, I have given in Appendix 2 a summary of my own understanding and use of the main facts and processes of natural selection as it operates in the natural world. Where possible I have included New Zealand examples seldom found in textbooks. Readers familiar with the contemporary theory can safely skip to the next section.

6.2 Facts and paradigms about human nature

Anthropology has amply confirmed that human social behaviour has evolved in gradual stages from that of our primate ancestors. Foley (1996) identifies eight key “events” in this prolonged story, starting with the origins of the earliest sociable

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anthropoids (the monkey/ape lineage) about 35 million years ago through to the development of agriculture and the end of purely genetically based evolution between about 30,000 and 10,000 years ago. For thinking Christians, this is no longer a contentious issue, although few have had the chance to work out the implications for Christian theology or for rational attitudes to the environmental crisis.

The technical definition of humanity is difficult, since human characteristics appeared slowly and over a succession of descendent species. According to Foley's scheme, which is widely accepted among anthropologists, the hominid lineage developed a social system centred on male kin-bonding between 15 and 5 million years ago, an almost human upright gait by 4 million years ago, stone tools by 2 million years ago, a rapid enlargement of the brain between 300,000 and 50,000 years ago, and the techniques of cave-painting by 30,000 years ago. The last migration out of Africa and the full colonisation of the rest of the world by true humans with language and agricultural skills was completed between 15,000 and 5,000 years ago. Sumerian writing appeared 6,000 years ago. The Bible takes up the story from about 3-4,000 years ago.

The concept that there are no theory-free data is a truism, but is no less true for that. All observations are interpreted through the framework of a particular paradigm that defines what sort of questions may be asked, and what sort of answers might be acceptable. It is important to appreciate this when considering any branch of science, but when it comes to the business of understanding ourselves, the limitations of science are at the same time more important to understand and more difficult to escape.

In a science that has for some time been governed by a stable, fruitful and widely accepted paradigm – such as the earth sciences since the establishment of the theory of plate tectonics - there is a broad consensus of agreement among practitioners about the interpretation of data, and few arguments about really fundamental issues. But the scientific study of human nature has emerged only recently, and it has certainly not yet reached such an orderly state, if it ever will.

In order to understand the human problems faced by the Fifth Mission Statement, we have to understand the biological bases of human morality. The neo-Darwinian perspective on human nature can be extraordinarily illuminating. Many other authors have also discovered new insights from "Darwinian history". For example, Colinvaux (1980) used an analogy with the idea of the ecological niche to explain the rise and

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fall of the classical empires; Crosby (1986) used natural selection to explain the historical success of European colonial expansion; Ridley (1993) used it to explain the pivotal role of sex in the evolution of human intelligence; and Betzig (1992) used it to examine the sexual propensities of the Roman emperors.

Equally important, it is necessary to present those data in a way which will make clear the differences between the competing paradigms through which human nature may be interpreted. Even within the group of those who agree that evolutionary biology explains the *proximate mechanisms* that predispose us to behave in certain ways (such as population geneticists, who concentrate on events at the level of the gene), there is no agreement as to how biologists should interact with those from other disciplines who are more interested in the *ultimate reasons* why we behave in those ways (such as sociologists and philosophers, who concentrate on events at the level of the individual or the community).

I have discussed the evolution of humanity in three separate sections. In Appendix 2, I have summarised as objectively as possible the main factual basis of the modern synthesis of Darwinian evolutionary theory, with particular attention to examples from New Zealand natural history. In S.6.2.2 and 6.6.5 below I introduce the ideas of multi-level selection and of emergent properties as an explanation of the origin of morality. In S.10.1, after presenting other ideas relevant to the matter, I discuss the possibility and the potential consequences of applying the evolutionary perspective to a contemporary understanding of the Christian theology of creation.

6.2.1 *The primate heritage*

Past a certain stage of development of intelligent self-awareness, rational and sociable animals begin to be conscious of conflicts of interests between one individual and another, and between the interests of any one individual and of the group. Very few primates are solitary, or have monogamous family units on the human pattern. Most live in sociable groups in which the basic unit is the adult female and her dependent young. Among all the 181 or so species of primates, the exact composition of the group is very variable between species and depends on definable ecological parameters, but in general, the distribution of females follows that of resources; and the distribution of males follows that of females (Wrangham and Peterson 1996).

By comparing various primate species we can identify the conditions that favoured, first, groupings of breeding females, and then, the addition of one or more males.

Comparisons must be made cautiously: for example, gibbons are almost always monogamous, and individual gibbons are more faithful to their partners on the average than we are, but humans are not gibbons. However, it is possible to learn a great deal about ourselves and our ancestors from careful studies of primates, especially our closest relatives, the chimpanzees. Understanding their implications for human sociality and moral dilemmas is one of the ultimate purposes of the many comparative studies and long-term observations described by primatologists such as de Waal (1989, 1996), Byrne and Whitten (1995), Runciman et al (1996) and Wrangham and Peterson (1996).

The higher primates have greatly advanced capacities for social learning and for reciprocal altruism, and individual members of the group easily recognise each other and remember past favours and abuses, friends and rivals. Chimps have separate hierarchies of rank among males and females, and high social rank is inevitably associated with higher reproductive success. Social hierarchies operate by and reinforce reciprocal altruism. The alpha male is not necessarily the strongest, but the one that is most skilful in forming and manipulating coalitions (de Waal 1982).

Male chimps form coalitions for political purposes: an aspiring male will cultivate powerful friends and use them to support political manoeuvres, or cushion the effects of a social fall, in an astonishingly cynical human way. Not for nothing is the chimp described as possessing pure “machiavellian intelligence” (Byrne 1995, Whiten and Byrne 1997). Bands of chimps will attack members of other bands, and have been known to completely wipe out rival groups (Wrangham and Peterson 1996). This apparently un-necessary aggression to strangers is inseparable from sociality, which involves both friendly co-operation and regulated rivalry between members of the same group.

Every individual chimp has an investment in its group, and could not survive without it, so the altruism that it will extend to its own companions, which is very definitely not available to outsiders, is hugely important. Individual captive chimps that have had a fight will reconcile afterwards with human-like affection; often a third party will get involved in a clear and apparently conscious attempt to defuse the tensions that inevitably arise in a restricted space (de Waal 1989).

Chimps have also developed not only more varied and context-sensitive personal interactions between the members of one group, but also systems of detailed cultural inheritance between the generations of one group - not instead of genetic evolution

by natural selection, but, through cultural selection, in addition to it. Humans still carry the echoes of the basic patterns of primate behaviour which were forged through the millions of years of our pre-human ancestry, and the evolutionary adaptations of our ancestors still strongly influence our attitudes.

6.2.2 The interactions between natural and cultural selection

The processes of natural selection, operating with ruthless logic upon individuals, rule the world of nature as described in Appendix 2. Humans too depend on the

Text Table 1 Consequences of natural selection in animal and human worlds: mixture of good and bad

Effect	Natural world	Human world	Scripture
Benefits self and community or other species	Oxygen from plants Decomposers Pollinators	Trade Food webs Pets	1 Kings 10:29 Lev. 26:3-4 Gen 30:15-30
Benefits self and own kind	Reciprocal altruism	Service clubs Adam Smith's "invisible hand"	Great Commandment Mat 22:39
Benefits self, no cost to others	Epiphytes	Stamp collecting	Meditation
Benefits self but damages own kind	Cancer cells	Tobacco advertising Tax cheats	Achan Jos 7:1 Zacheus Lk 18:8
Benefits self but damages whole community	Dutch Elm Disease	Deforestation	Disobedience to the covenant Deut 29:19

natural world for food and shelter, just as animals do, and we still live much of the time by the legacy of our animal ancestors - the rule of "look after number one" – which can have both good and bad effects (Text Table 1). Therefore, natural selection also works in human life. It acts on individuals and slowly, over many generations, since the only definition of success is the greater survival of useful genes compared with others. We share the same basic biochemistry with all life on earth; the same skeletal plan with all other vertebrates, the same reproductive mechanism with all other mammals, and about 99% of our genes with our closest relative, the chimpanzee. The past workings

of natural selection explain many aspects of human affairs, from back trouble and flat feet, hereditary diseases and senility, to the earliest stages of the evolution of morality (S.7.5.3).

Cultural selection is a closely similar process that works with memes, mental units of information or ideas. It can act very rapidly, and on groups as well as individuals. Cultural selection can be seen as an advance on natural selection, since unfit ideas can be eliminated without destroying the body that holds them (Text Table 2). Cultural selection also tends to be less ruthless, because it can

Text Table 2 The similarities and differences between natural and cultural selection

	Natural selection	Cultural selection
Units of selection	Genes	Memes
Combination with group selection possible	Rare (social insects only)	Common in humans
Sources of variation	Random mutation in DNA Recombination	Sudden inspiration Communication (conversation, publication etc)
Response to need	Very unlikely	Driving force
Mechanism	Interaction chance/ fitness /environmental demands/competition	Interaction chance/ planning/ cultural norms/competition
Consequences	Differential survival of physical characters	Differential survival of ideas
Cost of rejection	Death (personal, or reproductive)	Change ideas
Pace of change	Very slow	Rapid
Extinction	Always permanent	May be temporary

ignore the strings attached to all forms of altruism in nature, which rule out any form of animal welfare state. The effects of New Right economics on many aspects of human commercial life, which include the elimination of the unfit (that is, any body, corporate entity or individual trader, that fails to make a profit) are more reminiscent of natural than of cultural selection. Popular opposition to modern economic theory (S.5) surely includes

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unconscious resistance to the idea of allowing human society to revert to being governed too obviously by natural selection.

The main difference between immaterial ideas and material genes as units of selection is that ideas are optional, and can be mixed, diluted, acquired, modified or dropped by individuals during their lifetime, whereas genes are given, unitary, specific, inherited by strictly physical processes, and can be acquired only at conception. They cannot naturally be changed or lost during life, and any changes made to an individual, except by new medical technology, cannot be passed on to their children.

But like genes, ideas coexist in different combinations in different individuals, and easily outlive them. Like genes, ideas can mutate into new forms, which then have to compete with existing forms for survival. The sources of variation in ideas can often be, as in genes, a chance observation or a random event. Unlike genes, ideas can also be deliberately developed in answer to a need, and steered in a pre-determined direction. The result of this interweaving of natural and cultural influences on behaviour has been, eventually, the evolution of true, conscious human morality. But because humans are still animals, in the human world natural selection on individuals and cultural selection on groups are mixed, with complex results.

Failure to recognise the important similarities and differences between natural and cultural selection (summarised in Text Table 2) can lead to some extraordinary conclusions. An extreme example is the work of Ralph Burhoe (1970) who actually identifies God with natural selection, pointing out that both are interested in long-term improvements of types. This may be true, and certainly is an interpretation of religion that suits a scientific culture, but Burhoe fails to notice the differences between the processes employed. Natural selection's method of "rejecting that which is bad" involves the death or reproductive failure of the individual, which is surely rather a different matter from the Psalmist's prayer that God might "see if there be any wicked way in me, and lead me in the way everlasting", presumably by personal transformation (a cultural process). Like Richard Dawkins' scientific materialism, Burhoe's evolutionary naturalism is a metaphysical interpretation imposed upon the data, which has to be tested in terms of how well, or badly, it fits in with alternative interpretations. Neither deals adequately with religious experience or historical revelation, so neither has much appeal for Christians (Barbour 1997: 264).

6.3 The theory of gene-culture co-evolution

The model that best allows for the interactions of natural and cultural selection in humans recognises the subtle but important distinction between the levels of selection operating in humans. Natural selection is still there in our unconscious, acting at the level of the individual to choose between rival alleles*. But in addition, we have systems of conscious morality, which have evolved by the different process of cultural selection, and do operate largely for the good of the group. Moral systems have developed as part of our nature, to smooth the constant conflict of interests between members of the community. The seeds of conflict are always there when we do things that favour our own genetic self-interests over the cultural interests of the group, and an intuitive recognition of that conflict clearly lies behind the Augustinian idea of original sin (Campbell 1975). But in close-knit social groups all individual behaviour is a continual series of compromises that usually benefit the cohesion of the immediate group. Campbell points out that

for every commandment we may reasonably hypothesize a biological tendency running counter to some social-systematic optimum (ibid p. 243).

For example, the fact that it served the genetic self-interest of hunter-gatherer males to share their kills (because successful hunters gained social kudos and thereby more sexual partners) did not alter the consequences, which were good for the group.

Cultural selection among humans allows a high degree of group definition, strongly reinforced by the tendency of each member of the group to adopt the behaviour of the majority. This conformist transmission of the learned characters that define group identity acts to increase both within-group solidarity and between-group differences, and so to reduce the probability of defections from the group for personal advantage (Boyd and Richerson 1985:227). This unlearned propensity for within-group altruism is, of course, the basis of the *esprit de corps* of all cultural units such as schools, colleges and regiments. Human within-group altruism is not independent of biological altruism, but it is at least as closely governed by cultural influences as by genes. At the same time, culturally maintained groups organised into a metapopulation (eg football teams or college rowing crews, or even more so, national teams at the UN or the Olympic Games) have an unlearned predisposition for between-group rivalry, so they naturally compete. These are the conditions which

allow group selection at the cultural level, which in turn has profound consequences for understanding the behaviour of humans.

Gene-culture co-evolutionary theory starts from the assumption that cultural transmission must have preceded the earliest stone tool traditions in *Homo habilis* by considerable length of time. So humans and their hominid ancestors must have been reliably inheriting two different, well-organised systems of information, genetic and cultural, for at least two million years.

Bowker (1995: 17) points out that there is a spectrum of strong to weak theories of gene-culture interaction. At the genetic (Strong) end, genetic control of culture is all but total and natural selection is supreme. Culture merely serves the genes' struggle for survival, so genes hold culture on a leash. At the cultural (Weak) end, culture is seen as a separate information system with its own evolutionary history, hooked to the genes at various points but not tied to them. Culture has extended, or even slipped off, the leash. Bowker (p.35) classes early sociobiology, which was at that stage "regrettably triumphalistic"²⁴, at the Strong end, and the selfish-gene metaphor, which postulates separate inheritance of genetic and cultural data, at the Weak end. The difference between these interpretations explains the otherwise inexplicable fracture of several long-established university departments of anthropology into a cultural branch and a biological branch which, in some places, is severe enough to make communication between them impossible - at least until certain senior staff members move on.

The concept of prolonged interaction between genetic and cultural evolution helps to explain the human story. Boyden (1987) recognises four distinct phases in human history:

1. the primeval hunter-gatherer phase, lasting for tens of thousands of generations;
2. the early farming phase, which began independently in the Mediterranean, China and America around 400-500 generations ago;
3. the early urban phase, which began with the first cities in the near East about 200-300 generations ago;

²⁴ According to Jeff Schloss, giving his paper at the June 1998 Templeton conference at Berkeley.

4. the modern high-energy phase, which began in Europe and North America about 7-8 generations ago. The technological developments made during this very recent phase have allowed a massive and completely unsustainable population explosion, along with huge increases in the rates of extraction and consumption of non-renewable resources.

Boyden's fourth phase may well be our last, unless humanity manages to make an unprecedented transition to

5. the restoration phase, in which a more sustainable relationship between the human enterprise and the rest of the world is recovered.

The question of whether, and if so how, humanity can make that last transition is central to the Fifth Mission Statement.

The various outcomes of the interactions between genes and culture have been closely analysed by Durham (1991). He starts from the assumption that they cannot be independent, since behaviour and learning capacity may depend on genotype, while the genetic system may be modified by cultural selection. In principle, he identifies five possible forms of interactions.

- a. *Cultural mediation.* In a genetically variable population, it is possible to plot the relative fitness of different genotypes in given environmental and cultural conditions. When the cultural traditions of a population change the relative fitnesses of different genotypes, then culture mediates natural selection of the favoured ones. For example, malaria is a devastating disease, caused by parasites located in the red blood cells, and sickle-cell anaemia is a widespread, genetically controlled disease, caused by a recessive allele which destroys the red blood cells (making them look "sickle-shaped" under the microscope). In a population in which the proportion of genotypes having the sickle-cell trait ranges from 0-100%, an individual with 100% sickle-cells will die of anaemia, so the normal fitness of the trait is zero. But an individual with a mixture of sickle-cells and normal red blood cells has a much higher than normal resistance to malaria. In many parts of Africa, malaria is endemic, and there the individuals carrying some proportion of sickle-cell genes are at a great advantage. Cultural practices, such as slash-and-burn agriculture in tropical forests which greatly increases the number of breeding sites for malaria-carrying

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- mosquitoes, shift the relative genetic fitnesses of the sickling and non-sickling genotypes.
- b. *Genetic mediation.* Where there is a huge range of variation in a cultural property, of which only a subset are favoured for biological reasons, the distribution of the receptive genotypes will determine the distribution of the cultural trait. For example, all contemporary human languages describe colours, but none use more than 22 combinations of colour terms, out of the 2048 that are logically possible – because, apparently, only those are permitted by the neurophysiological architecture of the human eye and brain, and their linked colour-perception mechanisms.
 - c. *Enhancement.* Milk is a natural product for infant mammals, but adults tend to find it indigestible. The normal incidence of the genes producing lactase, the enzyme required for adult humans to digest milk, is only about 20%, and drinking milk causes sickness in the other 80% of adults. In areas with a long cultural history of dairy farming, the incidence of lactase among adults may reach >90% . Cultural acceptance of adult milk-drinking in dairy-farming populations has created an environment favouring natural selection for lactase, despite its initially off-putting effects. That in turn enhances the health and genetic fitness of the population.
 - d. *Neutrality.* If none of the possible variations in a cultural trait has any consequences for the genetic fitness of the population, all are free to develop unhindered by any biological considerations. This explains the riotous variation in cultural traditions of music, art and architecture, as opposed to the functional designs (not the surface decorations) of tools that are constrained by universal principles of efficient engineering.
 - e. *Opposition.* It is possible to find examples of cultural traditions which actually oppose the genetic fitness of the populations that practice them, but if the effect is severe, they will be short-lived. The example given by Durham is the epidemic of a devastating neural disease among the South Fore tribe of New Guinea, transmitted by cultural acceptance of cannibalism of deceased relatives. Examples from our own contemporary culture could include smoking and drink-driving.

Modelling the interaction of genes and cultural traits allows exploration of questions, relevant to theology, that lie at the interface between culture and population genetics. The most important conclusion from this research is that group selection of cultural traits can in fact be stronger than natural selection of personal self-interest, and that process can and does favour attitudes that benefit the group at the expense of the individual (Wilson and Sober 1994), and see Appendix 2. This is a welcome development, because the environmental crisis cannot be averted without some means of asserting

the primacy of public over private interests; yet traditional analyses tackling genes and culture separately have so far denied that any such assertion is even possible.

6.4 Game theory and the social contract

Philosophers have recognised for centuries that all individual humans are capable of both good and evil. The problem is to determine the relationship between the two. Is one inborn and the other learned? Is it a matter of priority of one over the other - either that human nature is basically good unless corrupted by evil, or, alternatively, that it is basically evil unless redeemed by good? There have been plenty of people down the ages prepared to assert one or other of these positions. More recent studies show, however, that the good and evil sides of our nature are not to be so neatly separated. As Jesus saw so long ago, they are like the wheat and the tares growing together until the day of harvest (Mat 13:30), and the reason why is illustrated by modern research on game theory.

The difficulties of making people co-operate for the common good (what Grant (1993) calls “the odds against altruism”) were integral to the idea of the social contract, developed in the seventeenth century by early modern thinkers such as Hobbes and Locke. It was an imaginary device to explain how solitary individuals or families have come together to form a society, accepting obligations to one another and binding themselves to a sovereign able to enforce those obligations (Honderich 1995:163). Their philosophical point was (and is) that political authority depends on individual consent, that is, the consent that rational individuals would give if they ever experienced life without authoritative rule. To make this fictional consent plausible, the early modern political theorists had to tell a story, which rests on crucial assumptions about the asocial condition of humankind as it used to be before or without political authority. Like the Biblical myths, its purpose was to make a comment, not about human society as it once was, but as it is or should be now. In the ideal society, co-operation for the common benefit is an unambiguous good, and rampant selfishness is evil.

The need for a social contract, as preferable to the “war of all against all” assumed by Hobbes, or the idea that “the sheer dangers of anarchy had forced beings who were natural solitaries to make a reluctant bargain” (Midgley 1994:110), are based on a series of spectacular misunderstandings of the lives, minds and social relationships of

our human ancestors and of the sociable primates that preceded them. Yet the central myth of freedom persists in our culture. Some western philosophers continue to assert that it is self-evident that we are, above all, freedom-seeking creatures, even though most other cultures have not thought so, and despite evidence that does not fit, such as facts about our deeply social nature (Midgley 1994:113). For example, Sartre and other existentialists placed great emphasis on the unique and radical freedom of human beings, to the extent that, “apart from radical freedom, there is nothing whatever to say about the nature of humanity” (Rue 1994:62). Would Hobbes or Sartre have considered these ideas as rational if they had been able to put them in the context of evolution and ecology? Darwin (who knew far less about primates than we do) thought not: he wrote in his notebook²⁵ “He who understands baboon would do more towards metaphysics than Locke”.

Game theory is a huge research field concerned with how and why people (and animals) make individual decisions in a social context. It has some features in common with political philosophy, but has been built up much more recently. Imported into biology from economics by John Maynard Smith, it has galvanised the study of animal behaviour. The classical, simple form of game theory, especially the famous Prisoner's Dilemma, also assumes that every decision is made in vacuo (I decide what I am going to do without knowing what you are going to do). In one-off Prisoner's Dilemma games a Hobbesian attitude does pay - the best thing to do is always to “Look after Number One”.

The standard explanation of the Prisoner's Dilemma is a fable about two burglars, A and B, who were caught and questioned separately. The police try to get them to inform on each other, even though they may have agreed between themselves to remain silent. The dilemma they each face can be explained by allocating scores to each possible decision. If A betrays B but B is silent, A gets off (score 5), and B is punished for both of them (score 0). If each betrays the other, both are punished (score 1 each). If both remain silent, the prosecution fails and both are freed (score 3 each). Obviously, the best thing to do is for both to remain silent, and both will score 3. But if A is silent and B confesses, then A will do time for them both (score zero) while B goes free (score 5). Remaining silent is a big risk for A, whatever B does. If both confess, the worst that can happen is that both get a score of 1, whereas each knows there is always the chance that the other will remain silent, in which case the one that spoke first will get the plum score of 5. Unless the commitment of each to the other is absolutely rock solid

²⁵ M notebook, p 84, 16 August 1838.

regardless of any threat or incentive the police might offer, the safest option for each in a one-off dilemma is *always* to betray the other, i.e. to make a totally individualistic decision, just as envisioned by Hobbes.

The Prisoner's Dilemma scenario does explain many short-term human interactions. People generally do not trust vagrant traders that they may never see again, and co-operation between strangers meeting casually is often difficult to organise if there are no obvious barriers to a more direct me-first attitude. For example, in a bank, post office or supermarket with many service points, all customers will in fact get fair treatment (defined as gaining service in the order that they entered the premises) if they form a single queue, but they will not co-operate with each other to do this, each voluntarily restraining the urge to dash for the first available window, unless there is a barrier to prevent others from barging past the patient ones and queuing at each window. Banks generally do install such barriers now, but supermarket checkouts do not, and the competition to spot the fastest-moving queue cannot be eradicated.

Environmentalism is the same issue - it is a form of the Prisoner's Dilemma game involving many players, and the problem is how to prevent egoists producing pollution, waste and exhausted resources at the expense of more considerate citizens. So, says Ridley (1996:225), we should accept that there is no innate tendency in humans which can be used to develop and teach restraint in environmental management. Far more than the social insects, humans who are expected to co-operate together socially are also in genetic competition with each other. Because we all instinctively watch our backs, *environmental ethics has to be taught in spite of human nature, not in concert with it*. Environmental activists and authors who eloquently describe the approaching global crisis, and plead for a fundamental shift in human values, underestimate the power of the games people play. At first sight, game theory seems to vindicate Hobbes: we don't co-operate because it doesn't pay us to do so unless everyone does, and only the most naïve would ever stake their all on the assumption that everyone will.

6.5 The importance of community life

The age of computers has provided a powerful means of exploring more complex forms of game theory, such as variation in conditional strategies (what's best for me to do depends on what you did last time *and what you or someone like you might do next*). For example, which side of the road one drives on is a conditional strategy; the best side to choose is the left in Britain, but the right in France. Since neither side is intrinsically

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better than the other, the choice is determined solely by what everyone else does. It is true that British cars are configured to drive on the left and French cars on the right, but British tourists in France wisely take more account of the habits of French drivers than of the configuration of their own cars when deciding which side of the road to drive on in Paris.

Until very recently most human interactions have almost always been repeated interactions with family, friends and colleagues within long-term, stable communities. And repeated (iterated) games of Prisoner's Dilemma (IPD) between the same players give very different results from the standard one-off game. - mainly because repeated interactions allow each round to be treated *as a deal rather than as a match*. The difference is that between a zero-sum game* such as football or tennis, in which only one side can win, and a non-zero-sum game such as social life generally, in which the more people co-operate together the more they all benefit. Real life is usually a non-zero-sum game, so the implications of IPD for social evolution are profound. At long last, it seems, science has discovered an empirical confirmation for what philosophers and moralists have always known, that the world is a better place when everyone restrains their personal self-interests. In terms of evolutionary psychology, the ethical systems of the world's major religions are (among many other things) comprehensive schemes of conscious instruction for maximising non-zero-sum social interactions.

The logic behind this conclusion was first explained to non-specialists by Robert Axelrod in *The Evolution of Co-operation* (Axelrod 1984). He organised a tournament for computer games, which showed that the long-term effect of many rounds of IPD is to favour co-operation - provided three conditions are met:

1. The total number of games is unknown (defection is always the best strategy on the last move, and so the opponent would do best to defect on next-to-last, and so on back down the series). Hence, Axelrod says, one of the determining factors favouring co-operation is that the "shadow of the future" should be long, and no-one knows whether they will be playing another round or not. *Translation: you never know your luck.*

2. There is an element of retaliation (if A tries defection, B should defect on the next move). *Translation: don't treat me like a doormat; completely unconditional love is not a practicable strategy for ordinary humans.*

3. There is an element of forgiveness (if A repents, B should co-operate again on next move). *Translation: I won't hold grudges if you don't.*

The best strategy, the one that won the tournament (and the next one as well) was operated by a programme called Tit-for-Tat. Its rule was very simple: always co-operate on the first move, and then do whatever the opponent did last time. This strategy was very stable in the long term, because it could not be exploited by more aggressive players (for fear of retaliation) but at the same time it was also forgiving, so when it got into a steady relationship with another co-operative player, it would never defect, and both benefited indefinitely.

There were disadvantages, of course. The first was that the total payoff earned by those playing Tit-for-Tat was smaller than could be gained by more ruthless players. On the other hand, the ruthless ones were seldom very long-lived. Unco-operative players did well at first - they tended to devour all the weaker, co-operative players and gain a high score in a short time, but after a while only aggressive players were left, and these gradually eliminated each other. As Jesus pointed out, those who live by the sword will soon die by the sword (Mat 26:52); Paul added that those who hate and devour one another will be consumed by one another (Gal 5:15). In business and politics too, no-holds-barred aggressive strategies rarely last for long.

The second disadvantage was that Tit-for-Tat was also vulnerable to mistakes. If one player defected by accident, the other retaliated, and so did the first, and so on until they got bogged down in mutual recriminations. The history of Northern Ireland is (hopefully, was) an all-too familiar example. If an IRA gunman aiming at a British soldier hit a Protestant bystander instead, the ensuing rounds of revenge and counter-revenge could go on for months. The significant feature of the recent peace settlement is that this problem has been recognised and the perpetuation of the war arrested by the recognition that violence can no longer be relied upon to stimulate a violent response. Even the most radical factions of the IRA now admit that the social conditions for armed struggle no longer exist²⁶.

But on the other hand, if both partners are playing Tit-for-Tat, it takes only a single offer of reconciliation by one, and the other can immediately co-operate again. Provided both continue to do the same, both can step back from the brink and then survive indefinitely. So the problem of endless recriminations can be avoided by a simple adjustment to the programme, called Generous-Tit-for-Tat. This strategy can allow for occasional mistakes and does not retaliate at once - so that, if the opponent co-operates again,

²⁶ Reported on a recent radio news bulletin.

peace is restored. This is the only programme that can do better than Tit-for-Tat in a standard tournament. The implications of this adjustment for politics and social life generally – and the echoes of Gospel teaching - are obvious.

The conclusion seems to be that indefinite co-operation is possible so long as one has a high chance of finding co-operative partners and does not get too greedy. The question is, in a (human) world full of independent egoists as envisioned by Hobbes, how can Tit-for-Tat ever get started? The answer is, the world never was full of independent human egoists.

Hobbes' assumption that people make solitary decisions about social life was simply wrong. For the whole of the 4-5 million years or so that hominids have been evolving, and for some 30 million years before that during which the anthropoid ancestors of the human line were evolving (S.6.2.1), there has been no such thing as a solitary, totally independent individual human, except maybe a dead one. Sociality always has been and still is as much a part of the definition of being human as is bipedal gait and a large brain, and it preceded both those characters by many millions of years. Not all primates are sociable, of course, but it is virtually certain that all species of humans and of their immediate ancestors, the australopithecines, always have been.

Within a stable social group, successful Prisoner's Dilemma strategies such as Tit-for-Tat can get their start, and they clearly demonstrate the advantages of local co-operation in a hostile world. Of course, there is always the danger of meeting someone playing a more hostile game outside the kinship group, and therefore there are always real limits to, and conditions attached to, altruism in nature (Appendix 2.3) - but over the long term the advantages of getting frequent reinforcement from the locals are well worth the occasional ripoff from an outsider. Nevertheless, co-operation among unrelated egoists is a fragile thing and can evolve spontaneously only on certain conditions. In humans, a Zahavian system of hard-to-fake signs of commitment (eg, as encouraged by hard-line religions) are important in identifying reliable partners in co-operative enterprises such as a business or even a marriage (Irons 1996). Even among primates, co-operation needs regular reinforcement by a predictable system of retaliatory justice. That is supplied in the first instance by social disapproval of cheaters (Boehm 1997), which then, in literate societies, becomes formulated into systems of written law (Irons 1996).

The literature on IPD has dominated research on the evolution of co-operation between unrelated individuals, but there are problems. For example, the mathematics of IPD involving large groups of players, such as a whole tribe or nation – the normal human

situation – soon become very complex, and their explanation by IPD alone may be questioned. Besides, there are other mechanisms. Two of them are potentially useful for the future of the Fifth Mission Statement; group selection (S.6.3) and the idea of co-operation as a by-product of emergency action in the face of a common enemy (Dugatkin, Mesterton-Gibbons, and Houston 1992). The environmental crisis can certainly be classified as that.

6.6 Models of the origins of morality

Centuries of debate about the origin of ethics, observes E.O.Wilson (1998:265-6), come down to this: either ethical precepts are independent of human experience, handed down to us from a transcendental source outside ourselves, or they are human inventions, open to empirical investigation. The choice between the two makes all the difference in the way we view ourselves as a species. It measures the authority of religion, and it determines the conduct of moral reasoning. Every thoughtful person has an opinion on which is correct, but the split between them divides, not religious believers and atheists, but transcendentalists and empiricists. The question of the existence of God is another matter, and cuts the other way - a transcendentalist could believe in the independence of moral values, whether derived from God or not, and an empiricist could believe in the human origin of moral values, whether guided by God or not.

Under Wilson's classification, I am a Christian empiricist. To me it seems clear that any character which, like sociality, has been ingrained in our nature fully as deeply and for much longer than our large brains must exert a powerful influence over our lives. And since morality is a key part of the problem of caring for creation, and sociality is necessarily linked to morality, we must pay it serious attention. If we wish to understand the processes that shape the human mind and spirit, we must first understand the processes that shaped the human species. As Mary Midgley puts it:

once we accept our evolutionary history as a general background, it is quite natural and proper to use it in explaining many elements of human life. If we shut morality off from that explanatory pattern of thought, we tend to make its relation to the rest of human life unintelligible, which cannot be an advantage (Midgley 1994: 14).

Of course, that is not to say that what is natural is necessarily good. There is no need to adopt the ruthless values of natural selection as our own. But it is important to

understand where our moral values come from, since if we modern people see a need to develop values different from those favoured in our ancestors by gene-culture co-evolution, or wish to change some disconcertingly stubborn parts of our nature, we need to know what we're up against (Wright 1994:31). That is why Christians concerned to make a useful contribution to the environmental debate must understand what evolutionary psychology has to say about the evolution of public morality and about how community decisions are made.

Very many of what we like to think of as human characteristics have their roots in pre-human behavioural patterns, and to recognise them is not to humanise animals but to show what an enormous animal inheritance remains in humans. That does not mean that humans are *merely* "naked apes", but it does mean that we need to understand the animal background which provides the historical context of our present moral dilemmas. Understandably enough, the classical philosophers and anthropologists had no access to that information, which explains why some of their assumptions are now having to be revised. For example, Elliott (1997) points out that no ethics can be grounded in biological impossibility, or allow behaviour that ends all further ethical behaviour. To the extent that the classical formulations were constructed on *a priori* human ideas such as equality and personal freedom, ignoring biological facts about, say, the finite limits to the earth's production capacity (S.4.1), to that extent those formulations must now be seen as contingent, not absolute - in Wilson's scheme, human inventions rather than independent laws of the universe. Because most human rights, laws and freedoms depend on the health and strength of the earth's ecosystems that support them, most cannot be universal, necessary and unconditional. Ultimately, facts can over-rule moral beliefs.

Classical philosophers such as Hobbes imagined that the default setting of human nature is the solitary individual engaged in perpetual war against everyone else, and that was perhaps a reasonable idea in the state of knowledge about the natural world available to him. It is certainly a revealing comment about how he perceived the state of western civilisation in his time. But if he had been born into a hunter-gatherer society, he would certainly have known the huge extent of the mutual obligations and co-operation that bound the community together, the joint work of kin selection, reciprocal altruism and cultural indoctrination. Hobbes' philosophical understanding of the origin of ethics now has to be replaced with one based on biology, such as Richard Alexander's study *The Biology of Moral Systems* (1987).

Most biologists agree that biological processes similar to those that operate among animals have influenced human society from its origins, and have engendered human attitudes still taken for granted in the modern world. For example, the taboo on incest is practically universal, both in human and in animal societies. Almost all animal parents that care for their young will discriminate in favour of their own offspring and ignore others; likewise, any human parents who gave no more care and affection to their own children than they did to all others would be seen as monsters (Midgley 1994:146). Conversely, the literary stereotype of the cruel step-parent is based in hard fact, both in human and animal societies. Male lions are certainly different from humans in the *extent* of their willingness to dispose of their predecessor's offspring, but not in *principle*. One careful survey found that pre-school children living in step-parent-natural-parent homes were *forty times* more likely to become abuse statistics than similar children living with two natural parents - largely because there are sections of human society in which children of former unions are seen to detract from the remarriageability of custodial parents (Daly and Wilson 1997).

Various means of discriminating altruisms, plus early forms of cultural traditions, can all be observed in the living primates, so they must certainly have been well-developed among early humans. Hence, the default setting of human nature is not, as Hobbes believed, raw individualism: it is the need and ingrained habit of fitting in with, and looking out for, one's own closest group. The kinship bands of our ancestors were real communities, not the faceless crowds we encounter in modern cities; they were places where individuals could find their place in society and in the world (Rue 1994:61). Even those at the bottom of the social heap benefited from sociality, because outside of their group, their chances of survival were drastically reduced, or nil. With increasing populations and resources, kinship bands could associate into tribal alliances, and then into kingdoms and states. The progress of this development among the Hebrews is well documented in the Bible:

The Old Testament was the first genetics text of all. It is largely a record of separation: of who is among the chosen. The idea of universal relatedness, a common humanity, is restricted to the New. Like most religious writings, both are codes for regulating society. Some people are labeled inferior, others are born to rule. In Biblical times, as now, human qualities were seen as innate and beyond control; the future, for good or ill, was set at birth. Kinship ruled those ancient lands, and, in spite of the supposed tolerance of the times in which we live, it retains its power today (Jones 1996:viii).

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Even in egalitarian social groups of animals, the tradable “currency” of favours regularly includes food or infant care, but social hierarchies open up additional possibilities. The connection between social status and breeding success makes status a resource in itself, so the exchange of status-enhancing favours is no different in principle from the exchange of food. Partners in such transactions develop coalitions, and coalitions can achieve much greater things in chimp, or human, society than any individual can do alone. The roots of manipulative human social behaviour and horse-trading of favours - such as that famously commended by Jesus in the parable of the unjust steward (Lk 16:1-8) - clearly run a lot deeper than most Christians would care to admit.

Throughout most of human evolution, the social environment to which natural and cultural selection gradually adapted our ancestors was one of overlapping primary and secondary groups, in which kin selection, reciprocity and group selection (in various combinations) worked reliably to ensure collective action, such as the sharing of food. But on the other hand, the more structured and socially cohesive a group, the more hostile it is likely to be to other groups. A flock of starlings is not a society in the sense that a band of chimps is, so starlings of different flocks simply ignore each other. Individual humans (and chimps) typically make great investments in their own social security and status, which helps to explain why humans, although among the most collaborative of all species, are also the most belligerent (Ridley 1996:193). So the default setting of human nature, the force behind the moral attitudes that come most naturally, is to be conditionally co-operative with members of our own group, but much less co-operative with - at least wary of, and if necessary hostile to - members of other groups (Alexander 1987). Any serious study of the Christian attitude to the environmental crisis must examine how these processes work, and understand their implications for the efforts of Fifth Mission Statement to stimulate a moral response.

Morality has always been considered to be a uniquely human achievement, but the precursors of it are well-documented in nature. That means that, strange as it may sound, morality preceded religion in evolutionary history: it is logically derived from evolutionary processes operating on the reciprocal behavior of intelligent creatures living in social groups (Reynolds and Tanner 1995:14). Darwin himself predicted that it would be

exceedingly likely that any animal whatever, endowed with well-marked social instincts, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well-developed, or anything like as well-developed, as in man (Darwin 1871:72).

Contemporary philosophers agree: hence Mary Midgley opens her book *The Ethical Primate* with the words:

Human morality is not a brute anomaly in the world. Our moral freedom is not something biologically bizarre. No denial of the reality of ethics, nothing offensive to its dignity, follows from accepting our evolutionary origin. To the contrary, human moral capacities are just what could be expected to evolve when a highly social creature becomes intelligent enough to become aware of profound conflicts among its motives (Midgley 1994:3).

Both intelligence and morality seem to be characters that could only have evolved among sociable animals, because they both facilitate the resolution of conflicts within and between sociable animals dependent on living in a group but also having different individual interests. The primary origin of the moral instincts is the dynamic relationship between co-operation and defection (Wilson 1998:280).

In nature, conflicts of interest arise from the interactions of genetic rivals. Biologists familiar with the ideas of evolution have no trouble accepting that it is natural selection, acting on the immense reserves of genetic variation that every surviving species has evolved over generations, that has produced the huge variety of individual strategies for living that we can see in the natural world. But many people are uncomfortable with the implication that genes could have a determining influence on human behaviour, or that such explanations can cast any light on what ethicists have always believed was genuine altruism or truly moral behaviour.

The argument revolves around several separate but related questions. First, to what extent is human behaviour directly influenced by genes, in the way that is widely assumed to follow from Dawkins' famous selfish-gene metaphor, and are genes really "selfish" anyway? Second, how could true human morality be derived by natural selection? Third, and most important in the present context, what are the implications of these ideas for Christian attitudes to creation? And do they help us understand human behaviour relevant to the present environmental dilemma?

6.6.1 Unconscious morality: the metaphor of the invisible hand

The genes that help to keep the fittest antelope one jump ahead of a cheetah are benefiting the antelope species as a whole as well as their own chances of replicating

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themselves into the next generation. But that was not their aim: they have no aim, and any beneficial consequences a gene might have for the species as a whole are purely incidental. It so happens that, in most living species, characters that favour individuals often do also benefit the group; if the balance changes, the species does not survive much longer. Adam Smith's famous image of "the invisible hand" applied the same idea of the incidental benefits of self-interest to human economics in only slightly different words. If this process is widespread, maybe it could count as a form of unconscious morality, which might to some extent reduce the need for conscious morality.

But in human society, the successful pursuit of the self-interest of one person or company (if it is favoured by short-term cultural selection) certainly does not always benefit society as a whole - as New Zealand's recent history amply illustrates. Did Adam Smith foresee this problem? Not according to Ormerod, who points out that Smith's economic philosophy *assumed* a moral climate in society which was generally accepted in his time but which we have largely abandoned. Smith saw

the enlightened pursuit of self-interest ...as the driving force of a successful economy, but in the context of a shared view of what constitutes reasonable behaviour...for Smith,...self-control was a natural, integral part of human behavior (Ormerod 1994:13).

In other words, although Smith is taken by many to have advocated the ruthless free-market economics of today, he might in fact have been operating out of a paradigm more moralistic than that of the philosophers who criticise him, or the biologists who have imported his theories into current models of population genetics

Whatever his intentions were, the fact remains that individual freedom is now a much more popular idea than public morality. That exaltation of the individual is part of the profound sea-change in western society generally labelled "modernism", which Michael Northcott defines as "the freeing of the spirit of individualism and capitalism from the traditional moral and ecological limits of ancestry and church" (Northcott 1994). In contemporary society, the conflicts of interest between self and beyond-self, private and public good, personal and group benefit, natural and cultural selection, are illustrated every evening on the TV news. Advertisers continually interrupt broadcast programmes in order to incite people to buy their products, whether they need them or not. Video shops persist in stocking dangerous films which degrade social relationships, give criminals ideas and permanently distort the growing minds of

children - because the shop owners are free (within very broad limits) to select whatever stock most increases their profits, regardless of the social consequences. The anonymity of urban society allows modern thieves to opt out of the rules of reciprocal altruism that governed our ancestors, without being denied the rewards of social life, including police protection of their own property against other thieves.

In civilised societies, natural selection of personal benefit is restrained to variable extents by cultural selection through education and social facilitation. When the cultural restraints weaken, individual self-interest reasserts itself, as William Golding pointed out in *Lord of the Flies*. Real life dramas in any disaster zone play out the same theme. Amid the total breakdown of civilian authority in Somalia, Bosnia, Ruanda and Kosovo, armed gangs ruled by the law of the jungle; in the aftermaths of the Floridan hurricane and the Rabaoul volcanic eruptions, looters cynically ransacked the damaged shops and houses. Even in ordinary life, the first reaction of most people to any economic news (say, a change in the state pension scheme, or in the rules of taxation, or a rise in interest rates, or a revision of the laws governing working conditions or health care, or an international stock market crash) is to ask "How are these changes going to affect my interests?". It seems to be as automatic and natural as breathing, part of our built-in survival mechanism. It is easy to assume that we have such reactions because their survival value has been proved over thousands of years: any tendencies to ignore possible threats to personal survival were eliminated by natural selection during our remote past. That implies that the metaphor of the invisible hand is mere wishful thinking. Is this true?

Proponents of sociobiology, launched by E.O. Wilson's massive book of the same name (Wilson 1975) do not hesitate to answer in the affirmative. Sociobiology has generated vigorous controversies for the last twenty years, by exploring the implications of extending gene-centred evolutionary theory to human behaviour. The row has given new life to the old nature-nurture debate, the question of whether inheritance or environment (natural versus cultural selection, again) most strongly controls individual development. The arguments on either side have been intense, and often unproductive. Philosophers such as Mary Midgley complain that

People have been strangely determined to take genetic and social explanations as *alternatives* instead of using them to complete each other. Combining them without talking nonsense is therefore by now fearfully hard work (Midgley 1978:xviii).

She goes on to argue that

the antithesis between nature and nurture is quite false and unhelpful...most activities of higher animals [are] both innate *and* learned' (ibid:54).

Those who continue to study sociobiological ideas but do not wish to be associated with the political arguments it stirred up tend now to refer to their work as "evolutionary psychology". Both forms of the discipline are interested in modelling the genetic effects of specific behaviours, but there is a spectrum of opinions on how, and to what extent, genetic and cultural effects are linked. In turn, interpretations representing the "strong" theories of gene-culture interaction have implications for ideas about the origins and functions of morality different from those of the "weak" theories.

6.6.2 The metaphor of the selfish gene

Sociobiologists deal first in abstract models, mostly those exploring the workings of gene-centred theories of evolution developed by population geneticists, and only later – if at all - in real animals. Any act of what might appear to be unselfish generosity, such as sharing food, they call "selfish" from the gene's point of view if it ensures that the donor will be given food or sexual favours in exchange. These in turn may lead to evolutionary advantage in terms of enhanced reproductive success. Altruism in animals, called by Wilson (1975) the "central problem of sociobiology", is thereby explained in selfish-gene terms, and in the natural world this insight has proved extraordinarily fruitful (Appendix 2).

When applied to the higher animals that are also profoundly influenced by non-genetic, cultural sources of information, selfish-gene models have to ignore cultural selection and the various other genetic processes besides natural selection that also influence the relative chances of a gene being transmitted to the next generation (S.6.2.2). Like the economic models with which they have so much in common, selfish-gene models treat these effects as externalities. The danger is that mathematical geneticists easily become so impressed by the elegance and predictive power of their models, that they come to see the models as the only reality and the real world as a product of confused perception (Ward 1996:28). Not only

theologians and philosophers, but also practising geneticists, call the selfish-gene metaphor “nonsense”²⁷.

To balance the following criticisms, we should note that it is possible to compile a useful list of the less controversial sociobiological insights, which are important and should be acknowledged (Cavanaugh 1996):

1. Understanding human nature is easier if we understand biology.
2. Culture is an elaboration of biology.
3. Free will must be exercised within biological constraints.
4. Moral systems have a biological component.
5. Our security and even our happiness depend on living consistently within our biological natures.
6. Our social structures – government, education, economic institutions, and religion – work best when they take cognizance of our evolved social natures.

On the other hand, hardline reductionism, i.e., attempting to interpret all the glorious complexity of the natural world as the unconscious product of natural selection operating at the level of the gene, is widely and severely criticised. Dawkins uses vivid language that often gives this impression, when he compares humans with “robots” whose genes have “created us, body and mind” [Dawkins, 1989:19-20]. Critics reply that it is possible to take this view only when all the positive effects of cultural selection are ignored and the metaphor of the selfish gene applied with force to all forms of life, appropriately or not. From there it is a short step to genetic determinism and all its intolerant bedfellows. According to this view, people of different races, genders and sexual orientation are born different, and there is nothing to be done about the inevitable disparities in wealth and status between them. Determinism can be a disastrous weapon in the wrong political hands.

Dawkins objects to this interpretation, pointing out that “genes do not control their creations in the strong sense criticized as ‘determinism’. We ...defy them every time we use contraceptives” (ibid :271). He reminds us of the well-recognised difference between the way a thing is and the way it should be. He asserts that his concept of the selfish gene is merely a hypothesis about our nature, constructed on the grounds that a prudent warrior takes thought to know his enemy before compiling any battle

²⁷ G.A.Dover, Dept Genetics, University of Leicester, during a seminar at Wolfson College, Oxford, 11 February 1997

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plan. He does not *approve* of selfish nature, as some of his opponents have tried to claim: quite the contrary. But he believes that genes and culture evolve independently, so any code of public morality we choose to develop must be done by deliberate, heroic choice against all the subtle influences of our genes. Such exhortations tend not to sound convincing when compared with Dawkins' frequent references to "our masters, the genes".

Dawkins does not argue that that genetic causes alone determine behaviour, since

that view is incoherent and no one holds it. [But there is] evidence for the view that they have *some* effect on behaviour, that can be found in a vast range of activities which cannot sensibly and economically be explained on any other assumption (Midgley 1978:67).

Of course there are no *specific* genes for aggression or racial prejudice or general nastiness, any more than there are genes for legs or eyes. All complex structures and behaviours are produced by the sequential interactions of many genes acting together within bodies capable of a great range of alternative paths of development.

Considering the numerous criticisms of selfish-gene thinking, it is surprising that it has survived as long as it has. Stephen Jay Gould suggests an answer:

Biological determinism has always been used to defend existing social arrangements as biologically inevitable - from 'for ye have the poor always with you' to nineteenth-century imperialism to modern sexism....the crude versions of past centuries [concerning, for example, the inferior intellect of black people] have been conclusively disproved, and its continued popularity is a function of social prejudice among those who benefit most from the status quo (Gould 1977: 258).

Gould's quotation from Jesus about the poor (Mat 26:11) completely misses the point Jesus was making, but his explanation for the popularity of biological determinism in contemporary times is astute, and, in my opinion, largely true.

But the concept of biological determinism relies in turn upon Dawkins' "gene's eye view" of evolution, and the intellectual credibility of both has been severely questioned in recent years.

1. Objection 1. The idea of the "selfish gene" is only a metaphor, since genes have neither a self nor the emotions to make them selfish. This is true, but there is nothing wrong with that: metaphors abound in science, and in all other systems of thought that deal in abstract entities including theology (S.1.6). But Dawkins has been fiercely criticised for persistently using, to general audiences, the word "altruism" in its restricted technical sense, even though people invariably understand it only in its well-recognised but quite different meaning in common speech (Midgley 1979). In the process, he and other evolutionists have changed the defining criterion from motives to effects largely without comment (Wilson 1992a). For some critics, this is evidence that Dawkins' metaphor of the selfish gene has become far more than a metaphor, a mere linguistic device; it is the "formative vision" (that is, the paradigm)

that shapes his fundamental understanding of life...the root metaphor is not the selfish gene, but selfishness as such....[this has] characterised modern thought since Descartes and modern institutions since the emergence of free-for-all economics" (Grant 1986: 446).

Darwin was himself a gentle person, but he was greatly influenced by the intellectual climate he grew up in – a ruthless industrial society in which merely staying alive was a struggle and only the fittest survived. Grant's thesis is that the origins of Darwinism as a way of understanding nature and (in its social versions) human nature were actually the opposite of what they are usually taken to be; rather than a theory of nature applied to human society, the theory itself reflected human life in the nineteenth century (Grant 1993:105). As Kuhn pointed out, the metaphysical assumptions of a culture exert a strong influence over the character of the scientific paradigms developed within that culture (Barbour 1997:146). That is the reason that I have introduced economic ideas into this thesis before those of evolution.

Objection 2. Sociobiology ignores an absolutely vital distinction between two very different forms of selfishness. *Evolutionary egoism*, self-service in the evolutionary sense, the operation of natural selection on unconscious genetic self-interest that is a property of genetic lineages, is not at all the same thing as *vernacular egoism*, or personal selfishness, the conscious individual self-interest that is a property of individuals and operates in opposition to cultural selection (de Waal 1996:15). Behaviour can be personally selfish but genetically altruistic, and vice versa (Wilson 1992a). The application of economics-based models of the inter-generational benefits of natural selection on the genetic self-interest of, say, the evolution of

parental investment in bears, is often appropriate and useful; but the personification of isolated genes as independent active agents capable of personal selfishness (Bowker 1995) is certainly not. Dawkins claims that he does try to avoid talking in such terms, but although he might understand the distinction, many who read him do not – and Grant's point was that to Dawkins the distinction is barely visible anyway.

Midgley (1978) does not deny the many valuable insights into human nature offered by the development of sociobiological ideas, but she rejects on principle that it is even possible to apply them to human behaviour without any reference to motive (mention of motive is regarded as teleological, associated with Aristotle and rigorously excluded from sociobiology and all other branches of contemporary biology, at least in theory). For example, on the central problem of altruism, Midgley points out that two totally distinct problems become confused when observations from animals are applied to humans. For animals, the question is whether a particular behavioural trait can survive if it leads its bearer to do things which do not *in fact* pay it (or its relatives), whereas the same question applied to people becomes

Can a conscious agent deliberately choose to do things that *he thinks* will not pay him? This problem can be considered only by people willing to take motives seriously...Officially...[sociobiology] ignores motives, but in fact makes constant reference to them, and because this reference is unacknowledged, its errors go uncorrected...[we must indeed] make full use of the evolutionary perspective as a background. But it is equally necessary ...to be capable of dealing with the foreground - of abandoning the long perspective and looking directly at the motives of individuals. We must take these motives seriously in their own right and not try to reduce them to ...behaviour patterns;...motives have ...their own evolutionary history ..and their own internal point, and it is virtually never a wish to bring about some evolutionary event, such as the maximisation of one's own progeny (ibid: 117, 128,142).

Midgley here identifies the problem that arises (again) when people fail to see the differences between natural and cultural selection. Natural selection does operate largely at the level of the gene, unconsciously predisposing us to individual attitudes that have been adaptive in the distant past. Cultural selection operates at the level of the meme (ideas), affecting groups as well as individuals, and involving conscious motives and moral agency over the short term arena of shifting cultural rewards. Human behaviour is influenced by both; as Midgley points out, we need to understand

the evolutionary background, but that is not enough. No account of human behaviour can ignore motives, or reduce moral reasoning to differential reproductive success. It is necessary to take seriously the point made by multi-level selection theory, that the experienced world does not only have value if it serves Darwinian fitness; it has developed emergent values of its own.

Objection 3. The fallacy of misplaced concreteness* is a constant danger for those who forget the distinction between models based on gene-centred evolution (interpreted through the metaphor of the selfish gene) and the reality of whole, functional animals. The theory of gene-centred evolution is based on extensive mathematical modelling, but models necessarily have to simplify reality merely to make the calculations possible. Vital features of real genetic systems, such as the hierarchical and essentially co-operative nature of genes (see Appendix 2.3 and Maynard Smith and Szathmary 1995) are forgotten, and the very many other dynamic and multi-level processes that determine genetic change are ignored (Wilson 1997a). So, although gene-centred evolutionary theory has had some astonishing successes in explaining animal behavior in the wild, the models it is based on involve many simplifying assumptions.

The fallacy of misplaced concreteness lurks behind Dawkins' curious notion that, since genes exist in millions of identical copies unaffected by their transition from one generation to the next, they must be the effectively immortal engineers that design the all too mortal, temporary individuals they live in (Appendix 2), and they are therefore by implication more important. Ward (1996:137) parodies this idea by picking up Dawkins' own analogy between genes and cake recipes - as if, Ward says, the only point of a recipe (a *codical* reality) is to be replicated in cookery books, and the cakes themselves (as *material* realities) are unintended by products! The parallel is valid in so far as genes and recipes are both codes of information, rather than concrete entities such as cakes and bodies. But the fallacy arises from the fact that codes of information and material bodies are entities belonging to different, mutually exclusive domains (Williams 1992). Both are real and both are important, but the relative permanence of the genes does not make them more "important" than the temporary bodies they build- it is the *interaction* between them that matters. A reality in the codical domain is only *potential* experience, not real life. The printed score of a piece written by, say, Bach in 1700 is one of many identical copies of a musical code that has been reproduced unchanged for 300 years, but it is only *potential* music. It takes a (relatively) short-lived material musician (more significantly, an orchestra of individually variable and distinct cooperating musicians) to lift the code off the page

and into a single unique performance experienced by the particular audience present on that night. The idea that the score could be important than the performance simply because it lives longer seems absurd.

R.C.Lewontin, himself an experienced geneticist, ridicules the assumption that the gene determines the individual and the individual determines society. Despite the name *sociobiology*, he says, the deeper ideology beneath it is the priority of the individual over the collective. The metaphor of the selfish gene is appropriate only to the extent that the biology of an individual is determined by its genetic make-up. That extent is greater in, say, a beetle than in a lion, but it is never 100% in any animal, and least of all in primates.

The underlying assumption is the one popularised by the film *Jurassic Park*, that if we had a large enough computer and knew the entire DNA sequence of an animal, we could construct that animal artificially. But that is simply not true: not even the animal computes itself only from its DNA. Any living animal at any moment in its life is the unique consequence of its developmental history, itself the interaction of genes and environment. It is not that the whole is more than the sum of its parts. It is that the properties of the parts cannot be understood except in the context of the whole. History transcends the limitations of either genes or environment to control us, because they have been replaced by an entirely new level of causation, that of social interaction (Lewontin 1991). In other words, by the emergent processes characteristic of the next level of selection.

6.6.3 Natural morality as self-deception

Evolutionary psychology recognises morality as a product of natural selection, just as is any physical feature. Wright (1994:26) points out that the similarity in physique that makes every page of *Gray's Anatomy* applicable to all humans of all races applies also to their mental architecture - the basic structure of the human mind is species-typical. It is therefore reasonable to speak of "the psychic unity of humankind". Among the products of the evolutionary heritage of humankind is the limbic system that controls our emotions (Wilson 1975:6), which stimulates the feelings of love, fear, racial hatred, sexual jealousy and many more that profoundly influence our daily decisions and which are common to all people. The problem is that some of these run counter to moral wisdom, which introduces severe personal conflicts, because over-ruling our deep-seated natural emotions is never easy. Freud

Part II: Background Paradigms

knew that well enough, but he was wrong in his speculations that “primitive man was better off knowing no restrictions of instinct”. As Wright (1994 :323) points out, this is a mere legend. It has been a long, long time since any “primitive man” could enjoy “no restrictions” on these “instincts”. Repression and the unconscious are the products of evolution too, and were well developed long before civilisation further complicated human mental life.

Because all humans are absolutely and necessarily sociable, these emotions generally arise in social contexts and have strong social effects, both for good and bad. One of their most important functions is to facilitate reciprocal altruism. Feelings of gratitude encourage the return of favours within a group; callous indifference to suffering is part of the retributive impulse; both help to reward co-operators and discourage cheats, and so are among the strong governors of reciprocal altruism, hence both were advantageous for thousands of generations of our ancestors' lives. Both maintain their place in our lives by creating powerful feelings of righteousness in those that practice them, plus the mechanisms of social approval and disapproval that monitor the behaviour of group members, often by unconscious mechanisms designed to make us think we are better than we are (Alexander 1987:139). All emotions that help to bind a group together and distinguish it from other groups are strongly favoured by cultural selection.

There is a darker side to this process as well. Tribal loyalty feels right because it helps to keep groups distinct, and therefore has always been strongly reinforced by cultural selection. Unfortunately, it quickly becomes racism, whilst retaining the feeling of rightness - so it is perfectly natural and socially acceptable to despise the enemies of one's own group, as the Jews despised the Samaritans. It was the anti-racist implications of the parable of the Good Samaritan that shocked the Jews who first heard it, not the generally accepted teaching that one should help a fellow-human in distress. In the overcrowded civilised world, racist feelings, which may still feel right and natural, are capable of even greater harm than ever.

At first sight, the idea that emotions drive moral behaviour is counter-intuitive. After all, the emotions are themselves the product of the same processes of natural selection that favour genetic self-interest in all life. Yet there is plenty of evidence to show that in the highest primates some emotions at least have become transformed into agents of social cohesion - which, combined with reflective, self-conscious intelligence, often involves the disciplining of personal self-interest and the beginnings of moral behaviour (de Waal 1989). But how can such an effect be produced by

natural selection? The answer seems to be that the positive effects of natural, evolved morality work largely through the unconscious. Feelings of personal moral worth serve to mask the self-deception that is necessary to equate natural emotions with socially “correct” behaviour. After all, self-righteousness could work as a moral force only if the selfish-gene basis of it is disguised.

The argument that scuttles most forms of reference to evolution as an explanation of human affairs is that appealing to nature as a moral authority incurs the is/ought error. But the morality-as-deception argument is that, under their scheme, the point is rather of *learning to be sceptical about our natural prejudices and intuitions*. For example, cynical indifference to the suffering of morally or socially unacceptable groups, such as gay AIDS patients, is an expression of the built-in biases of human nature, and is regrettably more common among religious fundamentalists than atheists. Loyl Rue (1998) calls this our “default morality”. Contrariwise, logic and trans-ethnic religious teachings meet in the idea of the extension of reciprocal altruism to beyond the kinship group - to include not only other human groups but also animals and the whole material creation, as recommended for other reasons by Singer (1983).

Francisco Ayala argues against the evolved morality-as-self-deception theory. Rather, it is only the *capacity* to construct moral codes that is rooted in biological evolution (Ayala 1998). Ethical behaviour in all its various forms depends on three necessary and jointly sufficient conditions, supplied by the biologically determined constitution of the human mind: (1) the ability to anticipate the consequences of one’s own actions; (2) the ability to make value judgements; and (3) the ability to choose between alternative possible courses of action. The moral codes themselves are the product of cultural evolution - which explains why they differ so much between societies. It was intelligence, not the hidden machinations of our genes, that allowed humans to develop those codes in historic time. Ayala’s interpretation could be seen to offer some hope that intelligence might get us out of our present danger, except that human history shows clearly that people do not always choose to do the right thing even when they know very well what it is.

6.6.4 True human morality: a rebellion against nature or the fulfilment of nature?

If humans are a product of natural selection, a process described by Williams as “morally unacceptable...evil [and] abysmally stupid” (Williams 1996:156), and the

evolutionary roots of human ethics involve self-deception, where does true human morality come from, if it is possible at all? Within the empiricist camp, the possible answers to these questions form two schools of thought.

The first group, led by Alexander, Dawkins and Wright, picture a voluntary, deliberate sort of human morality, one that pits us as rational beings against the brute nature that not only formed us but also deceives us as to what it has been doing. Arnhart (1998) labels them “Hobbesian Darwinians”, who assume that humans are ineradicably self-centred. According to them, evolutionary psychology shows us how to look behind our evolved moral feelings and see the self-interested genetic machinery that drives them. We can then choose whether or not to obey. Effectively, they claim that we have outgrown our genes, learned how to examine them objectively and figure out how they operate - even that we are the only organisms on the planet capable of defying them. How can we do that?

One suggestion draws a parallel with the history of the House of Lords. That venerable institution destroyed its own power to hold back the political development of Britain by assenting to the successive Reform Acts of 1832, 1867 and 1884, which vested the ultimate authority of Parliament in the House of Commons. In Lewontin's metaphor (1991: 123), “the genes, in making possible the development of human consciousness, have surrendered their power both to determine the individual and its environment”. The process is all the more remarkable because, as Wright (1994) put it: natural selection, a creative process²⁸ devoted to selfishness, has eventually produced organisms which, having finally discerned this creator, could reflect on this central value and reject it.

To Alexander, Williams, Huxley, Dawkins, and their followers, Lewontin's metaphor is simply nonsense. The genes have not surrendered control, they have merely gone underground. Raw nature (as represented by the evolved form of self-deceiving morality produced by natural selection) is something that truly moral humans have to fight *against*, and true human morality is a counter-force, a rebellion against our brutish makeup, rather than an integrated part of human nature. In Rue's terminology, our “default morality” produced by natural selection has to be modified by the moral code programmed into us by our culture, our “over-ride morality”, which takes constant

²⁸ Wright is incorrect to call natural selection a creative process; it is a sieve, not a sculptor (Gould 1993b:317) - ie, it cannot create fit organisms, only eliminate the unfit - See Appendix 2, S 1.4.

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effort and moral discourse but is necessary if we are to find ways of superceding our biology:

Chimps cannot manage anything as global as universal brotherhood. Nor could we, if we did not have the mediation of symbols to help us over-ride our default morality (Rue 1998:533).

In other words, there is no such thing as natural altruism, and true human morality has to act *in opposition* to our animal nature, be imposed upon it in order to bind and control it. The classic quote is from Richard Dawkins, who believes passionately that if we are ever going to develop real unselfishness and a code of morals, we must do so by our own effort, because our genes will not help us:

Be warned that if you wish, as I do, to build a society in which individuals cooperate generously and unselfishly towards a common good, you can expect little help from biological nature. Let us try to teach generosity and altruism, because we are born selfish... We, alone on earth, can rebel against the tyranny of our selfish replicators [genes] (Dawkins 1989:3).

The advantage of evolutionary psychology, according to its proponents, is that, the better we understand it the more likely we are to be capable of detecting and rejecting ancient prejudices. We do not have to take our cues from our primate origins now that we can see them for what they are: but on the other hand, if we don't see them we remain in danger of being manipulated by them. But surely, all such ancient prejudices have always been perfectly well understood by traditional spirituality, and labelled with the single, simple and challenging word, "sin". Taken seriously and understood from the heart, existing Anglican teachings and sacraments already offer more than enough resources to anyone genuinely concerned to deal with them.

The second group, represented by de Waal and Gould, is labelled by Arnhart (1998) the "Aristotelian Darwinists", because they disagree that the conscious motives that underpin human morality must necessarily be independent of, and superimposed upon, the self-serving evolutionary process that shaped our minds and bodies. They dispute the reductionist view of humans as potentially but not naturally moral, as hypocrites living in constant denial of our thoroughly selfish nature (Wright 1994). For example, Gould points out that

Basic human kindness may be as 'animal' as human nastiness...our genetic makeup permits a wide range of behaviours - from Ebenezer Scrooge before to Ebenezer Scrooge after ...Functioning societies may require reciprocal altruism. But these acts need not be coded into our consciousness by genes; they may be inculcated equally well by learning (Gould 1977: 266, 257).

de Waal (1996:117) provides plenty of evidence from primatology to support Gould's assertion that limited forms of kindness and co-operation are natural to the sociable animals nearest to us. These actions convey a direct benefit to individuals, not merely to their genes. Among our closest animal cousins, social environment shapes and constrains individual behaviour. Evolution *has* produced the pre-requisites for true human morality, including mechanisms to defuse tensions within a group, a tendency to develop social norms and enforce them, the capacity for mutual aid, a sense of fairness, and so on. All these are regularly observed in chimpanzees, and the comparable processes in us are merely extensions made possible by our higher intelligence.

The fact that the moral sense goes so far back in evolutionary history that other species show signs of it plants morality firmly near the centre of our much maligned nature. It is neither a recent innovation nor a thin layer that covers a beastly and selfish makeup (de Waal 1996:218)...Instead of concluding that morality is a cultural construct that flies in the face of nature, Huxley and his followers would have done better to broaden their perspective on what the evolutionary process can accomplish (p. 162)...To give the human conscience a comfortable place within Darwin's theory without reducing human feelings and motives to a complete travesty is one of the greatest challenges to biology today (p.117).

Ridley (1996: 141, 144) agrees:

Virtue is indeed a grace.....something to bedrawn on and cherished. It is not something that has to be created against the grain of human nature - as it would be if we were pigeons, say, or rats with no social machine to oil. It is the instinctive and useful lubricant that is part of our natures. So instead of trying to arrange human institutions in such a way as to reduce human selfishness, perhaps we should be arranging them in such a way as to bring out human virtue.

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In other words, “grace does not destroy nature, but *perfects* it”, as Aquinas maintained (Hall 1986:138). In terms of the gene-culture co-evolution models of Durham (1991), this is a case of enhancement. Cultural traditions such as religion reinforce existing group selection favouring the better survival of the most strongly co-operative social groups. It is our best hope for the future.

6.6.5 Religion and morality

I see the debate between the Hobbesian and Aristotelian Darwinists as the old Pelagian argument in modern dress. The Hobbesians represent Augustine’s position, that human free will is weakened and incapacitated by our inherited nature -damaged not by Adam’s sin, but by the self-deceptive mechanisms built into the animal foundations of our moral systems. All the moral outrage characteristic of Augustine’s disparaging view of the origins of human moral conflict is there in Dawkins and Williams. On the other hand, the Aristotelians represent Pelagius’ position, that God made humanity knowing precisely what it is capable of doing (McGrath 1994: 373); moreover, humans retain the rationality and free will that God gave them, so in theory are capable of making real moral decisions. De Waal’s more charitable view of the origins of moral conflict presents a real contrast to that of the Hobbesians. The crucial repercussions of the historic Pelagian controversy for the Christian doctrines of grace and merit have no modern parallel, since they are not relevant to the Darwinists’ debates, but the difference in the tone of their attitudes to human nature is comparable. For de Waal (1996: 17), the Hobbesian’s proposed abyss between morality and nature is quintessentially Calvinist - the age-old half-brute, half-angel view of humanity.

The proponents of the idea of morality as a rebellion against selfish nature might be expected to acknowledge religions as at least potential allies. One of the key selective values of early religions was that they reinforced and fostered group-centred altruism (Barbour 1997: 263, Burhoe 1979, Wilson 1977) . Of course there is also competition for cultural and biological success *within* the group (Irons 1997), but that is temporarily set aside when the group is faced with a threat from outside.

On the contrary, the reductionists see *both* morality and spirituality as evolved, unconscious self-deceptive mechanisms now embarrassingly revealed by the cold light of scientific logic. They allow that spirituality might once have been an important cultural

arbiter of morality, but that time is now past (Wilson 1977). The traditional religions are seen as part of the evolved but now outdated animal heritage that truly enlightened humanity has to fight against:

traditional religious beliefs have been eroded, not so much by humiliating disproofs of their mythologies as by the growing awareness that beliefs are really enabling mechanisms for survival (Wilson 1977: 3.)

To the hard-line reductionists, the process of looking behind our evolved moral feelings and seeing the self-interested genetic machinery that drives them therefore requires the rejection of all traditional religion. In so far as religious behaviour is capable of fostering inter-group rivalry, even to the extent of causing local extinction of the population (as on Easter island: Bahn and Flenley 1992), the reductionists' bitter criticism of religion does have a point. In terms of the gene-culture co-evolution models proposed by Durham (1991), their understanding of true human morality interpreted as a conscious rebellion against a genetically-based system of self-deception could be seen as a case of opposition.

However, not everyone would agree that this is a fair or accurate description of religious behaviour. For a start, the level of religious belief among scientists in general, although not a majority, is still substantial (about 40%) and has not changed much over the last 80-odd years (Larson and Witham 1997). Furthermore, in so far as religion can encourage group-centred, cultural-based altruism at the expense of personal selfishness, which in turn favours the genetic survival of the group, then religious traditions can be a cultural force which favourably influences the direction and/or strength of biological evolution. To those who believe that the survival and prosperity of their societies are more important than their own, a functional explanation for religious beliefs does not undermine them at all – rather, it constitutes an immediate reason for accepting them (Austin 1980:194), whether or not that acceptance is accompanied by any real conviction about the existence of God. Such an attitude requires the future, thinking church to accept as valid a rather deliberate sort of faith²⁹, but not one to be sniffed at:

²⁹ Reason and faith are not opposites: C.S.Lewis was one of the most famous of many who have been led into the Church by Reason (Lewis 1977).

In the past those who came to see that religion is just human became themselves non-religious. Today this is no longer the case. The first *conscious* believers are appearing, people who know that religion is just human but have come to see that it is no less vital to us for that (Cupitt 1984:19).

In terms of Durham's models, this interpretation of the role of religion would be better seen as a case of cultural mediation. For a worked example of this reasoning, see S.11.3 and Fig 5.

Cultural mediation of genetic fitness via religious practices could reasonably be regarded as a good thing, so the question arises: what are the implications for Christian theology if the calculus of the genes is there underneath, cloaked by an evolved, unconscious moral sense that prompts us to behave nobly anyway - at least towards members of our own group?

I agree with de Waal that there is no problem here provided we are able to distinguish between process and outcome. We do not need to let the ruthlessness of natural selection distract us from the wonders that it has produced. Just as diamonds are the product of intense heat and pressure, or birds and aeroplanes appear to defy the law of gravity yet are fully subject to it, moral decency may appear to fly in the face of natural selection yet still be one of its many products (de Waal 1996:16, 12). We need not be ashamed of the genetic processes that formed us, like children embarrassed by their old folk, but neither need we be dependent on them now.

Humans and other animals have been endowed with a capacity for genuine love, sympathy, and care - a fact that can and will one day be fully reconciled with the idea that genetic self-promotion drives the evolutionary process (ibid:17).

If, as Christians believe, God is involved in evolution from the very beginnings of life until now, it is reasonable to expect God's work to be all of a piece, that the thrust will be all in the same direction. If morality is the highest capacity of free, conscious creatures capable of entering into a spiritual relationship with God, then it may be expected to *fulfil* nature, not to combat it. I see no difficulty with Wilson's (1975:120) interpretation of spirituality as just one more Darwinian enabling device somewhat like nursemaids, nurturing our ancestors as they stumbled along the slow road from *Australopithecus* to

Christ, *provided* we do not remain as infants in need of nursemaiding indefinitely. We have to grow up, through all the stages of evolution from natural selection through cultural selection to God's realm of no selection (Fig 3). In Paul's famous analogy,

When I was a child, I spoke like a child, I thought like a child, I reasoned like a child; when I became a man, I gave up childish ways (1 Cor. 13:11)

Wilson's suggestion is valid when taken to refer to tribal religions, but not when applied to fully-developed Christian theology:

All our highest ideals and most difficult aspirations, the agonies of spirit and the heroisms of moral commitment, stand revealed as mechanisms for the multiplication of DNA. The suggestion is so extraordinary that we might wonder if any rational person could make it seriously...what the biological moralists are really doing is to impose their own moral ideals on the evolutionary process...They reduce the aims of morality to the minimal end of survival, thus depriving survival of any particular point or purpose beyond itself...and [they] reduce the importance of moral endeavour and individual responsibility virtually to zero (Ward 1992:67,77).

After quoting Dawkins' call for conscious altruism to fight against "the tyranny of our selfish replicators", Ward asks

Why should he *hope* that altruism is possible, unless he really does have a basic sense of moral obligation? And isn't it odd to see morality as a rebellion against our true natures, instead of as a fulfillment of their potentialities? They [the reductionists] express the integrity and intrinsic dignity of human existence, even as they explicitly disclaim it. Their case is built on a contradiction and cannot prevail (ibid: 161,168).

Philip Hefner (1993) offers one answer to Ward's question: the Hobbesian Darwinists plead for cultural over-riding of genetic programmes because they are not yet ready to accept the cultural programmes carried by myths and rituals, because those packets of cultural information defy evolutionary explanation for so long as the existence of cultural group selection is ignored. Colin Grant (1993:108) points out that Dawkins' plea for a totally unnatural altruism in defiance of the selfish determinations of the natural order is not a repudiation of the modern self-centred perspective but a

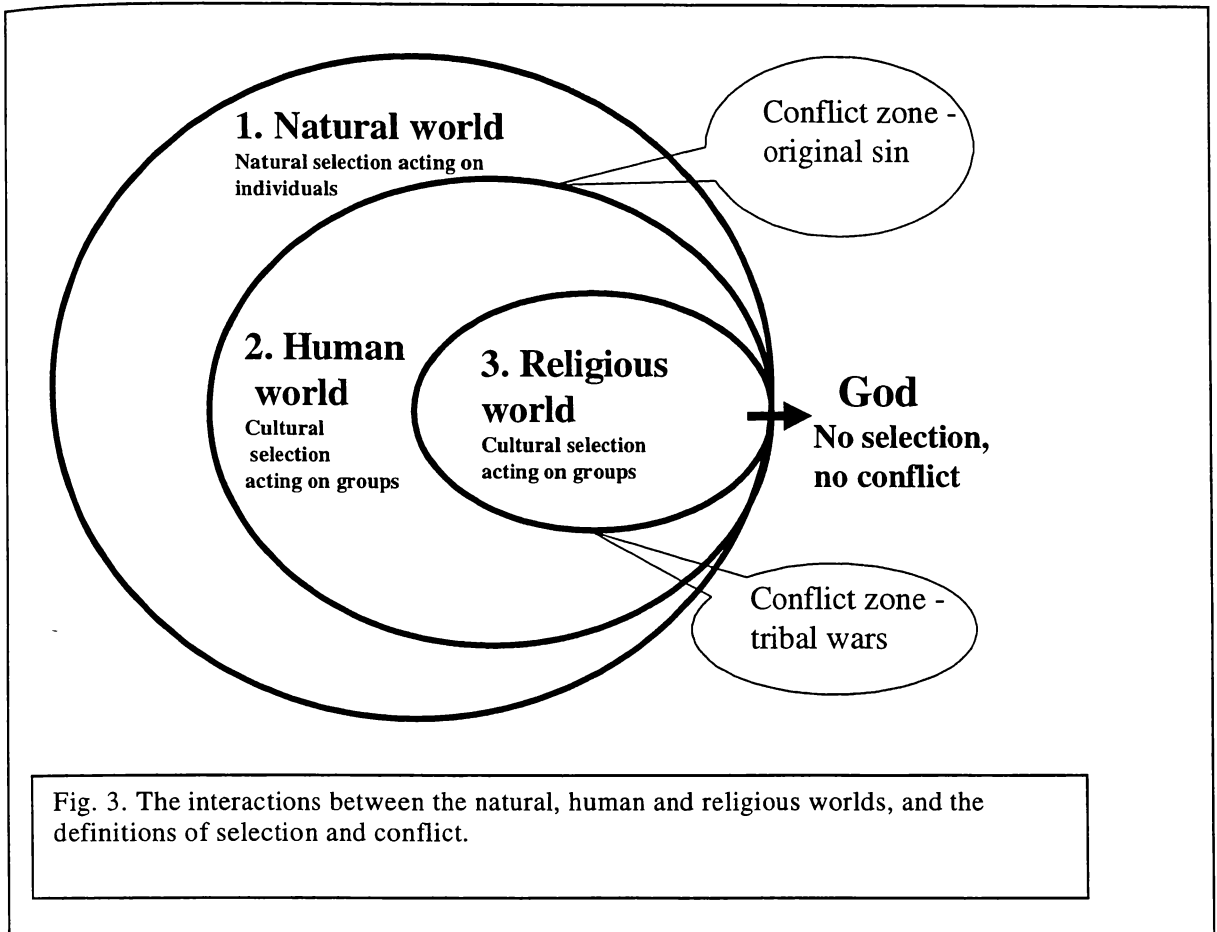


Fig. 3. The interactions between the natural, human and religious worlds, and the definitions of selection and conflict.

further instance of it; because it claims that we are free to assert whatever values we choose over this alien realm of nature.

My view is that Christian theology need have no quarrel with the idea that the evolutionary *roots* of moral behaviour could be linked with self-deception - indeed , it has said much the same, in different words, from the beginning.

Personal righteousness is a noble ideal, seldom achieved, which means that those who claim it are necessarily deluded. The New Testament writers were quite forthright about that:

If any think they are religious, and do not bridle their tongues but deceive their hearts, their religion is worthless (Jam 1:26);

If we say that we have no sin, we deceive ourselves, and the truth is not in us (1John 1:8).

But evolved morality is not enough. Biological predispositions are real, but they cease at the frontier of the tribe, so that is where Christian theology must take over from

evolution. The possibility that the next level of a multi-level hierarchy of selective agencies could produce more co-operative behaviour than the last does not necessarily count as searching for skyhooks (Dennett 1995); on the contrary, to deny the possibility leads in the direction of greedy reductionism. Evolved morality cannot answer the greatest question of all: "And who is my neighbour?", which is at the heart of the Fifth Mission Statement .

6.7 Conclusion: moral history and the environmental crisis

Part of the reason that the environmental crisis is so hard to deal with is that it is so recent, which means that few human cultures have anything in their traditional knowledge that could help us defuse it. This is a dangerous situation, because:

The novelty of modern social environments is such that the proximate behavioural mechanisms which were adaptive in pre-industrialised societies are no longer adaptive (Irons 1997: 45).

For example, we have deep-seated panic reactions to snakes and spiders, but not to electric sockets or speeding traffic. People now tend to live in much larger groups, in which the dynamics of reciprocity that underpin supportive social groups tend to break down. In modern western society it is common to find whole streets full of suburbanites who do not even know who their neighbours are, still less talk to or love them. Mobility works against co-operation, by undermining the chances that any two people or family groups will be able to establish a long-standing exchange of favours. Secondary and even primary groups break down with increasing frequency, leading to personal disorientation and a pervasive sense of meaninglessness. Traditional myths are rejected, because they are seen to conflict with other forms of knowledge, especially but not only science, but modern culture offers nothing in their place that has anything like their former vigour and authority. There is no agreed picture of reality as a template for ethics, and no social congruence of ideas about how things are and which things matter - a dangerous state which Rue (1989) calls "amythia". E.O.Wilson's summary of the human dilemma is that we evolved to accept one truth, but discovered another: people, long adapted to believe in gods, have found biology (Wilson 1998).

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Most recently, the philosophical/economic ideas of private property and individual freedom have opened up hitherto undreamed-of scales of opportunities for private exploitation, at the same time removing many of the social restraints on personal profit-making. Economic stratification of society reinforces the ancient primate dominance hierarchies, providing powerful incentives to accumulate conspicuous wealth instead of (or as well as) reproductive rights. Self-deception provides ready defences against suggestions (from green activists on all scales from local communities to Rio) that the rich might have an obligation to curb their consumption in order to help the poor. Such arguments, going back to Thomas Malthus, suit the efforts of the middle class to feel better than the rest. Charity from the rich, they say, only makes the poor breed all the more, or (the more modern version), the poor are lazy bludgers on the state and don't deserve to be helped.

When self-interest is restrained by local interactions and the relentless scrutiny of inescapable close associates, it can drive the various forms of co-operation and conditional altruism that underpin the lives of social animals. For humans living in today's anonymous commercial world, those old restraints are weakened. Among the first casualties have been the remaining indigenous peoples of the world, who still try to hold on to the social and religious structures that worked in the past. The ultimate and most significant casualty is, of course, creation itself.

Unfortunately for the environmental movement, it is basically unnatural to humans to think in terms of the global, rather than the local, community (Heinen and Low 1992). We are creatures adapted to small groups, ideally not more than about 150 strong. The real danger of our time is that, faced with frightening new dangers of unimaginable scope, people will retreat into long-established but now inappropriate reactions (usually traditionally religious or racist). They do no good, but instead drain the moral energy needed for, and inhibit the practical work of, reconciling the interests of individuals, local groups and the global community. If we are to find a solution, we have to do it together, and soon.

7 CULTURAL VARIATION WITHIN NEW ZEALAND IN ATTITUDES TO ENVIRONMENTAL ETHICS

The main business of any large environmental management agency such as the regional councils or the Department of Conservation (DoC) is to optimise the practical administration of protected lands, plus the administration of various statutes controlling the resource use, pest control, regulation of game harvesting and the protection of threatened species. These problems are difficult enough in themselves, and until very recently, most people would have described them as requiring mainly legal, administrative and scientific solutions. Cultural dimensions rarely came into consideration, or if they did, only as uninformed comparisons between Polynesian and European ideas of environmental management. More recently we have realised that, in New Zealand as everywhere else in the world, today as much as yesterday, environmental problems are largely cultural in origin (Evernden 1992, James 1990).

Obviously, finding an appropriate answer to any problem depends on asking the right question. If the Church wants to get involved in finding the answers, it must now be asking, what was the question? What would be considered to be appropriate solutions to any of New Zealand's current environmental problems, and why? Once the Church has considered that question, then it will be in a better position to consider what it might do to help.

It is logical to begin by defining what kinds of problems we are up against. At first sight, many appear to be ecological problems of, for example, habitat protection to increase the numbers of threatened species, population management to reduce the numbers of pests, wise use and recycling of resources, efficient management of pollution and waste, and so on. On one level, that is true: but as Passmore (1980) points out, there is much more to it than that. An ecological problem is not the same as a problem in ecology. A problem in ecology arises simply because science does not for the moment understand what controls certain processes, for example, how DDT got into the fat of Antarctic birds. The solution to the problem brought understanding, and presumably (although Passmore did not say so) contributed to the eventual ban on use of DDT.

7: Cultural Variation in environmental attitudes

On the other hand, an ecological problem is a special type of social problem. To label something as a “social problem” is not to suggest merely, or perhaps at all, that we do not understand how it comes about; it is labelled a problem because we believe that our society would be better off without it. To label it is to evaluate it, to classify it in value-laden terms. For example, Hitler was obsessed with what he called “the Jewish problem”, but, in Passmore’s commendable understatement, most of us do not believe there ever was any such problem (ibid, p. 43). To apply the same reasoning to contemporary New Zealand: unemployment is a very serious social problem for a very large number of families, but to economists operating under the assumptions of the free-market model it is not a problem at all, only an externality, an inevitable cost of economic growth, and to MPs (caught between Treasury and the voters) it is a problem only when it affects their chances of re-election. The extent to which any democratic society is able to tolerate the social or ecological conditions created by the policies of their leaders (or occasionally, with respect to apartheid and nuclear accidents, other society’s leaders) is a good indicator of that society’s culture and values.

In the New Zealand context, the emphasis on bicultural development tends to lead people to assume that the concept of “cultural attitudes to conservation” is concerned mainly with the differences between Maori and pakeha. But this is too simplistic: there is no single attitude characteristic of all Maori or all pakeha. Maori tribal histories are all separate and individual, and members of one tribe respect the rights of other tribes to speak for themselves, so the attitudes and willingness to participate in any particular debate of any particular Maori will vary according to the history and resources of their tribal area. For example, coastal tribes were historically more intensely concerned with marine fisheries than were inland tribes, and tribes with no tradition of kiore hunting would not feel qualified to comment on the current controversy over the extent to which kiore should be preserved on offshore islands needed as mammal-free refuges for vulnerable native fauna.

Similarly, there is a wide range of opinion among European New Zealanders. Some groups emphasise the dynamic nature of natural communities, look to the future and favour a pragmatic view of conservation, keen to protect what can be protected but willing to accept irreversible changes, such as (at least the least damaging of) the established introduced species. At the other extreme are those that retain a more idealistic view of New Zealand identity which is largely rooted in the past, who label the pragmatists as defeatists and refuse to give up the vision of restoring New Zealand - or at least, large chunks of it - to something close to its original state. In my

opinion, the gulf between the pragmatic and idealist views among pakeha conservationists is probably wider and more significant than that between Maori and pakeha in general. On the other hand, most pakeha conservation groups are strongly opposed to those, including some Maori, who favour market-driven philosophies that value commercial exploitation of resources ahead of preservation of biodiversity for its own sake.

The idea of biculturalism is now commonly accepted in the political, ecclesiastical and social life of New Zealand, and has done a great deal of good in introducing pakeha conservationists to at least some Maori views on important environmental questions. But it masks the important fact that, for example, the concept of “traditional harvesting” is not a racial issue confined to Maori groups, since there are at least as many pakeha also claiming the right to continue practising various transplanted forms of traditional harvesting, eg deer stalking and trout fishing. To a substantial sector of pakeha society, “Deer hunting is integral to the national psyche. If you doubt that, take a brief look at New Zealand literature, poetry or art” (Caughley 1983).

With reference to environmental management, I have identified (King 1996) three quite distinct cultural groups in New Zealand, similar to but not quite identical with the “four perspectives” independently listed by James (1990). To me, the primary differences between idealists, traditionalists and pragmatists are ideological, and to label them as racial is to misunderstand them. Individuals of any race may belong to any of the three cultures, but the three are not mutually exclusive except in their most extreme forms. Most people will probably identify mainly with one group most of the time, but will also sympathise with one or both of the alternatives for some of the time, according to whereabouts they stand on the preservation-versus-use debate concerning any particular issue. Some of the attitudes characteristic of the three conservation groups are illustrated in Text Table 3, and contrasted with the attitudes characteristic of a fourth group with whom all three are at war, the commercial developers. Rather along the same lines, but from a British point of view (ie, without consideration of unique New Zealand concerns such as the Treaty of Waitangi), Pepper (1984) distinguished between radical ecocentrics, conservative ecocentrics and technocentrics.

What we see in front of our eyes depends substantially on what is behind them. No two people look at the same view and see the same things. Imagine a representative of each of the four groups described in Text Table 3 standing on the hill overlooking the Clyde Dam and discussing their reactions. The traditionalist would grieve over the

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insult to the *taniwha* of the Clyde and the destruction of many important cultural sites and productive farms; the idealist would remember with anger the political duplicity behind the decision to build and the extensive disturbance to wildlife habitat in the Clyde valley and surrounding area; the developer would see a triumph of technology against huge human and geological odds; and the pragmatist would appreciate most of the others' arguments but, given a *fait accompli*, try to make the best of it. I have discussed the implications of these distinctions for conservation management in New Zealand elsewhere (King 1996).

These differences in perception are real and very important. For example, developers *cannot* see what traditionalists see, because to them any talk of a *taniwha* is so much nonsense. Yet to traditionalists, accustomed to thinking in metaphorical language, the concept is plain as day, based in long-tried custom, absolutely serious and relevant to contemporary planning processes. James K. Baxter relates a comment made by an old *kuia* about a dam proposed for the Wanganui: "If they build the dam", she said, "the *taniwha* of the river will destroy it". Baxter agreed - not, of course, because he expected to see a huge water lizard rise up to push the dam over, but because in the Maori mind the *taniwha* represents a life principle which, if desecrated, is capable of taking its revenge in other ways. The *kuia* was pointing out that if commercial developers try to take natural resources by force, ignoring the traditional values honoured in Maori mythology, they will get their way but will be no happier for it (Baxter 1971). Much the same point is made, from a western perspective so without the Maori imagery, by David Ehrenfeld in his stinging criticism of modern environmental management, *The Arrogance of Humanism* (Ehrenfeld 1981).

Value systems determine not only what problems people can see but also how they respond to them. Attitudes to the important issues of the day, such as the Treaty, management of exotic species, harvesting and commercial development, vary from one group to another depending on what each identifies as the problem, which in turn depends on their value system.

The pragmatic response to DoC's chronic shortage of funds has been to set up a ranking system whereby the most critically threatened conservation objectives can be identified and targeted for priority funding (Holloway 1993). The trouble is, any ranking system inevitably requires a series of assessments of relative values, which will not be judged in the same way by members of different cultural groups. Conservation itself is defined in the Conservation Act 1987 as

Text Table 3 The spectrum of attitudes to environmental protection in New Zealand (extended from King, 1996)

Group	Idealist	Traditionalist	Pragmatic	Commercial
Position on preservation/use spectrum	Preservation	←	→	Use
1. Basic philosophy	Ethical environmentalism	Practical environmentalism	Political/scientific realism	Utilitarian individualism
2. Place of man in nature	Separate, responsible for all unnatural change	Part of, interdependent with nature	Both part of and separate, with responsibility to manage	Separate, with licence to exploit
3. Purpose of nature	Has own purposes	Sustain humanity	Purpose absent or debateable	Enrich humanity
4. Understanding of natural world	Literal, mixed reason and empathy, impose own meaning on it (things are not as they should be)	Empathetic, symbolic, non-rational, see meaning (supplied by tradition) in it	Rational, meaning valid but personal	Rational, meaning not relevant
5. Main focus in time	Past	Past and present	All time	Present and future
6. NZ values to be protected	Natural, non-cultural	Natural and cultural	Ecological	Economic
7. Main value system	Natural, non-human	Spiritual, human	Rational (classical science)	Financial, human

8. Attitude to Treaty	Should be implemented, but not at cost of conservation lands	Must be implemented in full	Should be implemented, with negotiated adjustments if nec.	Compromise if nec. for commercial reasons
9. Attitude to exotic species.	Exterminate them all	Accept if useful, except major pests	Accept if ineradicable, except major pests	Utilise
10. Attitude to large-scale resource/commercial development, eg, dams, logging	Judgemental: Human benefit doesn't justify exploitation that damages wildlife or landscape	Resistant: No human benefit comes from exploitation without spirituality	Conciliatory: Negotiate agreements allowing sustainable use <u>plus</u> protection of nature	Enthusiastic: Human benefit demands exploitation of any economic resource
11. Attitude to harvesting wild resources	OK only for ineradicable pests	OK for any species if useful	OK for any species if sustainable	OK for any species if profitable
12. Definition of main conservation problem	Persuading stakeholders of philosophical case for strong legal protection for all remaining natural resources	Balancing cultural, historical and scientific values of remaining natural resources	Balancing social, financial and scientific demands for access to remaining natural resources	Removing political and technical obstacles to access to any profitable remaining natural resources
13. Action required	Preservation at all costs, on grounds of rights/telos/virtue	Conservation for use	Conservation for preservation <u>and</u> use	Emasculation of inconvenient conservation legislation
14. Associated social attitude	Purist, nationalistic	Co-operative	Co-operative	New Right, materialistic

The preservation and protection of natural and historic resources for the purpose of maintaining their *intrinsic values*, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations (Conservation Act, S.2),

but “intrinsic values” are not defined. This introduces a serious complication in discussing the values held across the spectrum of attitudes held by parties interested in conservation. The Act is the foundation legislation empowering the Department of Conservation, which controls about 30% of the land area of New Zealand. Since the maintenance of the intrinsic values of natural resources is one of DoC’s main functions, a clear definition of it would have strengthened DoC’s defences against the various criticisms that have, inevitably, dogged its operations from the start. However, that is not easy.

The concept of intrinsic value enjoys a wide range of philosophical definitions among conservationists, as well as between conservationists and their opponents, which cannot be subsumed into a single formula applicable in all situations (Gunn 1988). Things which have intrinsic value are: valued as an end, not as a means; settled and long term; proactive not reactive; worth making sacrifices for; closely linked to sustainability; irreplaceable; unsubstitutable; identity-sustaining; holistic. All these are valid descriptions of the features that intrinsically valued things have, but not all such things have them at all times and places. “That not all good things can be pursued at once is as true of conservation as of any other endeavour”, says Gunn. Perhaps the best single characteristic he gave is a negative one, contrasting intrinsic value with market value, which is “the value that happens to be put on something by somebody for the time being”. Philosophers and conservationists have no problem accepting that the difficulty of reaching a definition on such a complex and context-sensitive matter as intrinsic value does not in itself invalidate the concept altogether. But Hartley (1997:ix) merely dismisses the idea of intrinsic value as meaningless, an inappropriate objective for DoC’s operations that “represents an insuperable barrier to accountability”. Economists in general seem not to realise that some institutions, such as conservation organisations, exist *despite* demands for accountability, not in order to serve it.

Natural and historic resources are defined in the Conservation Act and in the Historic Places Act 1980, respectively. “Intrinsic values” are assumed to be properties of these resources, defined (in relation to ecosystems) by the Resource Management Act 1991 as values which they possess “in their own right”. For example, endemism

(species confined to New Zealand) and rarity are intrinsic values of some species; *mana* is an intrinsic value of some places. But the idea that these values are intrinsic in the sense of being independent of human judgement, a central tenet of idealistic “deep-green” theory (Sylvan 1992) cuts no ice with pragmatists, since “Value supposes a valuer, and only humans do this” (Parkes 1994:7). Parkes’ own practical experience of ranking systems “attempting to compare the value of ‘apples with pears’ that are threatened by ‘fire or moths’ [leads him to the conclusion that] There is as yet no rational way to resolve this dilemma to the satisfaction of all....This confusion shows ... that natural resources do not have values that are independent of the valuers” (Parkes 1994:23).

There are also other, more fundamental objections to all attempts to assign any value, relative or absolute, to natural resources, as discussed in detail by Ehrenfeld (1981). Not only does the valuation process pre-suppose complete knowledge that we seldom possess, but any value assigned can change. If a resource such as an undisturbed swamp is protected because the land is considered to be more valuable as a protected swamp than if given over to some competing use, what happens if it is later revalued, so as to become worth exploiting, or devalued, so as to be not worth protecting?

It is true that personal values do introduce intractable arguments and problems into value ranking systems; but we cannot do without them, for two reasons. First, the debate about conservation policy, which in New Zealand has to include making value-laden ranking judgements simply because we cannot protect all natural values that need protecting, is best seen as a *strategic* issue, a matter of planning, largely independent of the *intellectual* debate about whether wild things and places do in fact have intrinsic value (Norton 1989). The case for conserving nature as a cultural need is strong enough already, so it should make little difference to conservation policy in general whether intrinsic value is also attributed to nature or not. Second, in the words of Wendell Berry, quoted by Ehrenfeld (1981): “The use of the world is finally a personal matter, and the world can be preserved in health only by the forbearance and care of a multitude of persons”.

7.1 Cultural variation in value systems

Traditionalists share with pragmatists the middle ground of the preservation/use spectrum. Both have a dynamic view of nature and a realistic acceptance of change, such as the addition to the New Zealand fauna of the more useful exotic species³⁰. Maori hunters value feral pigs as highly as members of the NZ Deer-stalking Association value wapiti, and both have been known to oppose culling for conservation purposes. Both groups accept the concept of conservation for some degree of use as well as for preservation, plus truly sustainable harvesting and implementation of the Treaty. Both reject senseless commercialisation, although for different reasons. Both have a generally co-operative attitude to each other and to negotiations with other groups, although traditionalists will be most concerned about cultural and historical matters while pragmatists worry more about the social and financial costs of implementing agreed programmes. The main difference between them is probably that, whereas spirituality is an inseparable part of reality to traditionalists, most pragmatists are likely to regard it as personally valid but more an *optional extra* than an actual, *essential part of the view*. Hence, traditionalists may find themselves arguing against management staff with whom they otherwise agree on most things, if the point at issue is one concerning spiritual values.

For example, to pragmatists schooled in classical science, it is obvious that the few surviving acutely endangered birds such as kakapo should be taken from remote southern islands to more accessible places where they can be more closely managed. Because their own cultural filter is so strong, Wildlife Service/DoC managers did not until recently even think it necessary to consult the southern *tangata whenua* about such operations; now they have to consider the opinions of Maori traditionalists who dislike seeing their treasures being taken out of their tribal lands. For similar reasons, other tribes are objecting to the extermination of kiore, regarded as a treasure to their own ancestors, on islands within their tribal areas scheduled for restoration. The traditionalists' argument in such cases seems incomprehensible to anyone not willing to take account of the significance of the

³⁰ Although further introductions of the more highly visible exotic species, such as deer, have been banned since about 1910, government-funded research on identifying, testing and importing beneficial biological control agents – mostly exotic insects – continues apace (Taylor and Smith 1997)

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spiritual dimension of their value system. The problem becomes particularly intractable when the point at issue is the value system itself.

At the extreme preservation end of the spectrum are the idealists. Because they value natural values above human ones, they tend to take a simple and somewhat judgemental view of all human interactions with the environment, on the grounds that no human benefit is justifiable if it does permanent damage to wild life or landscape. They criticise both the settlers for bringing in deer and tahr and the modern recreational hunters who want to continue shooting them; they support petitions and direct action against logging and mining, turn out in all weathers to plant native tree seedlings or rescue stranded whales, and promote a distinctly purist, nationalistic view of conservation policy in general. Most particularly, they are the ones that never abandon their most fervent desire, however hopeless, to see the extermination of all introduced species from all protected lands. They have a set of non-negotiable premises, such as the need for both absolute legal protection of wild life and for the public ownership of the conservation estate, which they defend with maximum passion, enormous courage and zeal, and minimum room for compromise. Their convictions are almost religious in intensity, and indeed their attitudes have much in common with the more fundamentalist versions of Christianity. They do get things done, for generally admirable motives; but their inflexible position lays mines in the path of real dialogue with other cultural groups, such as traditionalists pressing for restoration of Maori land ownership or harvesting rights.

At the opposite end of the preservation/use spectrum are the commercial developers. Intense competition, international marketing and mobile capital have freed them from the strict necessity to conserve some of today's resources for tomorrow's use, since when this resource is exhausted they can pull out and invest in another one somewhere else. Sometimes this process can have positive conservation effects, if the resource is a pest; it was the power of commercial exploitation by helicopter hunting that so drastically reduced the formerly abundant wild red deer of the South Island, with consequent beneficial effects for the forests. But from the hunters' point of view, that was an unintended side-effect.

Commercial developers in general are dedicated to anthropocentrism, and tend to find conservation arguments inconvenient. In the past they have been allowed to ignore them, but since the conservation law reforms of the last 10-15 years developers such as electricity generating authorities have been forced to restore water to wild rivers and to co-operate in drawing up sustainable management plans.

Some large firms, such as Comalco, have read the public mood correctly and changed their view to the extent of offering generous funding for conservation projects – partly because, of course, they still get a commercial benefit, if only in good publicity. More recently, commercial interests such as the New Zealand Business Roundtable have strongly argued for the relaxation of restrictions on development of natural resources (Hartley 1997), and there have been less well documented reports citing the possible loss of overseas investment by firms “scared-off” by the red tape. It is as if all the old arguments between developing the new and hanging on to the old are about to begin again.

7.2 Resolving cultural conflicts

Arguments between cultural groups are rarely resolved by listing the “facts” of the case, since the facts are themselves perceived through cultural filters. Instead, the opposite tends to happen. Wilson (1992b:26) points out that most people conform to the Principle of Uncertainty, which states that, if there is evidence both for and against a belief, the result is not a lessening but a heightening of conviction on both sides. Hence, the important thing to discover is not whether a fact advanced by another party is true, but why it seems true to them. The process of negotiation requires each side to

listen to what others say, and reflect not necessarily upon the “truth” of their arguments, but on why they make them and believe in them, i.e. from what material or ideological vested interest position they speak, and what broader assumptions and philosophy serve this interest. And if we wish to influence their thinking, we shall have to study the history of how their thinking came to be as it is - for we cannot effect a process of change without first knowing how changes came about in the past (Pepper 1984).

For reasons that by now should be unsurprising, vested interests are important components of the cultural filters through which each group views their environment. The different interests of each group ensure that they all see different perceived environments. Perhaps the process of listening to and dissecting each other’s statements would have more chance of success if we had a system of corrective lenses through which we could all appreciate each other’s views and, to some degree, accept each others’ values even if we don’t always agree with them. In other

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words, we have to be prepared to do for our opponents what we all automatically do for our friends. That means swimming against the tide of pre programmed us-versus-them attitudes inherent in human nature (S.6.2), which explains why it is not easy.

For example, the February 1994 issue of *Forest and Bird* printed side-by-side four very different viewpoints on the idea of using state-owned conservation lands to settle Maori grievances under the Treaty of Waitangi. The article by Kevin Smith, Conservation Director of the Royal Forest and Bird Society, *There must be another way*, illustrated the potential for misinterpretation of the motives of other groups, that can so easily lead to downright racism, that can creep into Treaty issues. He wrote:

Conservationists feel uneasy when faced with the bald challenge: 'You just don't trust Maori, do you?'. Yet the only honest response for many who have pondered this issue is that in many instances we don't (p.15).

Casual or biased readers who already share that view might easily stop there and draw a racist conclusion from this statement, but Smith's intention is to point out a different, even larger issue, that illustrates the discussion in S.5 on the conflict between private and public interests in the management of common-pool resources. He goes on:

Nor would we trust any private group with the management or control of sizeable tracts of publicly owned conservation land. There is no doubt that deerstalkers, fish and game councils, local bodies and ecotourism operators all are committed to conservation. Yet each has its own perspective and self interest that would make others in the community uneasy about their having a greater say in management decisions over reserve land than others.

The Resource Management Act 1991 now requires full consultation with all stakeholders affected by any management decision, a policy that meets Smith's concerns and those of anyone familiar with the processes of negotiating agreements between independent parties.

The Maori view of the issue was put by Tipene O'Regan, in a comment headed *A great sadness*. Maori intentions are frequently misrepresented, he says; in fact they never had and do not have any intention of claiming exclusive access to any formerly public land that might be returned to their ownership. The only exclusive right they claim is to interpretation of their own heritage of myth and history in the parks. Any

proposals for commercial use would be submitted for approval under ordinary legislation and so be on an equal footing with all others. Hartley (1997: 431, 456) advocates the full-scale transfer of all DoC lands to Maori ownership, as a final solution to the problem of settling Treaty grievances and a more dignified means of supporting the Maori renaissance than targeted welfare and anti-discriminatory legislation. Such a sweeping change in law would depend on an equally sweeping change in attitudes to public ownership of, and commercial development in, conservation lands, especially among the idealists. It would certainly be very interesting to know what the attitude of the Anglican Tikanga Maori would be.

Progress in conflict resolution depends strongly on fostering the willingness of each group to accept the values and judgements of other groups. For example, the pragmatists' conviction that classical science provides the only kind of truth needed to resolve conservation issues leads inevitably to a reluctance to accept that judgements based on other kinds of truth could be relevant at all. To take a merely hypothetical example, this principle could in future mean that conservation objectives valued by DoC, such as the clearing of kiore from an island in order to restore a *pre-human* ecosystem, might be set aside in favour of a conservation objective favoured by the local tangata whenua, who wish to restore a *pre-European* ecosystem.

However, the art of seeing another person's point of view requires an unusual degree of good will and empathy, and some understanding of their culture. The earliest European explorers to encounter the Classical Maori in the full flower of their development had plenty of good will, but found to their cost that good will could not always make up for offences caused by their total ignorance of Maori etiquette. In 1772, Marion Dufresne and his companions were killed by Te Kuri (the chief on whose land they set up camp) mainly because they had unwittingly violated a host of tapu laws that affected the everyday life of Te Kuri and his people. The visitors did not understand the concept of tapu, or the outrage they caused by fishing, hunting with muskets and felling kauri in a blatantly sacrilegious manner. They ignored Te Kuri's people's protests against such behaviour because they could not share the Maori conviction that disregard of tapu would jeopardise the spiritual and physical well-being of the whole tribe (Duyker 1994:150).

7.3 Implications for the Fifth Mission Statement

Over the last twenty or thirty years of conservation science, there have been perceptible changes in attitudes and values in New Zealand society and among scientists and managers concerned with conservation. Anyone could list a dozen examples: here are just a few from my own field of interest, pest management. The formerly despised wild red deer have leapt from pest to asset, with reverberating social, legal and political consequences (Caughley 1983). Feral farm stock, once exterminated as pests at every opportunity, are now recognised as repositories of potentially useful genetic diversity that should be conserved while it is still available (Rudge 1990). Attitudes to the management of rabbits have ranged across the whole spectrum from extermination (failed, abandoned in 1972) to a combination of 1080, night shooting and natural predation (successful until the mid 1980s) to a huge public argument about myxomatosis resolved only by government decision in 1993, to a still-current questioning of the whole idea of whether pastoral farming in the most rabbit-prone lands of central Otago should continue at all (Gibb and Williams 1994), and eventually in 1997 to the illegal introduction of the rabbit calicivirus disease by a group of disaffected farmers - a pre-emptive strike whose effects are still unclear (Jarvis 1999). These changes in attitude are indeed sweeping, but in fact reflect only changes in the relative financial value of particular types of stock or land. They are understandable, market-driven responses by the affected individuals to variations in their conditions produced by the ordinary economic system, whilst all around them the rest of the population carries on as before.

Other changes do reflect genuine shifts in *personal or philosophical values* detectable at virtually all levels of society. They are therefore much more significant to any discussion of cultural conflicts. They have spurred impressive national commitments, enshrined in recent legislation, to sustainable resource management; to long-delayed justice for Maori; and to the welfare of animals, even those regarded as pests. For example: a few years ago an American wildlife officer, hamstrung by regulations prohibiting many of the most effective weapons against animal pests then available in US, asked me why we still had such freedom in New Zealand. I replied that since most of our animal pests were introduced and were never supposed to be here in the first place, many New Zealanders felt free to attack them in any way that worked. In those days people used to go out of their way to run over possums and rabbits on the road (some probably still do). Now, rising political and social rejection of some of our standard and hitherto never-questioned techniques of removing pests,

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such as 1080 and the leg-hold trap, will make them totally unacceptable at some time in the future. Other methods seen as inhumane have been prohibited altogether - part of the reason that the proposal to introduce myxomatosis was finally abandoned was that the general public (ie most people except Otago and Canterbury farmers) now consider that even pests do not deserve such cruelty. Humane alternatives, such as might be provided by advances in biocontrols, are much favoured even though they are still 10-15 years away (Jolly 1993), and raise many social problems of their own, such as unpredictable public responses to the perceived risk of genetic manipulations (Williams 1993).

Other people would look beyond specific examples and say that, however much our environmental awareness has increased and our intentions to save the earth improved, at root nothing has changed. Evernden (1992) believes that part of the reason for his feeling of *déjà-vu* in American environmental politics is that western thinkers habitually define as problems only those questions to which the application of ever more science and technology are the only solutions. Perhaps, he adds, it is high time we reframed the problems and posed some different questions - or even asked if thinking in terms of problems and solutions is the only viable approach. I venture to suggest that we in New Zealand might be already exploring that path, not because we are more percipient than Americans, but because we have the Treaty of Waitangi.

The Treaty is the reason that environmental managers trained in western science and technology are now setting an example to the world on how to integrate traditional conservation management with the Maori view of nature. The Maori view is not a primitive phase of understanding the same reality that westerners see; it is an advanced understanding of a totally different reality, and it *does* ask different questions - especially of those pakeha that espouse the extreme views at either end of the preservation/use spectrum of western nature philosophy. The message is clear, and frequently raised overseas as well as here: the various forms of contemporary and of traditional understanding of nature need to learn from each other. We need to be willing to listen, to put aside our prejudices and try to correct our vision to see what other cultural groups see, so that future management policies can be both technically possible and conceptually appropriate for a multi-cultural society, and cultural conflicts over conservation issues can become truly resolvable to the satisfaction of all parties. As one experienced and empathetic conservationist put it: There is always common ground between people who know and like each other, so the key to good management is to take the trouble to build up personal relationships with the various parties involved in any decision. "Friends always work things out. Or, to turn it around,

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if people work things out, by the end of it they'll be friends" (J.G. Innes, pers. comm.). This sort of mediation requires exactly what an informed, alert, contemporary Church can contribute – a cool-headed but affectionate view of human nature, combined with a theology that encourages people to trust each other and negotiate conservation agreements in good faith.

PART III: AN INTRODUCTION TO BIOTHEOLOGY

8 THEOLOGY OF CREATION

8.1 Introduction

For the Church, the contemporary environmental debate is having the very good, if unintended, effect of focussing attention on the Christian doctrine of creation. That attention is often very critical, because the Christian attitude to the natural world is widely perceived to be exploitative and inseparable from that of the pre-scientific age in which it was formulated. Yet, as Peacocke (1979:46) points out,

any affirmation about God's relation to the world, any doctrine of creation, if it is not to become vacuous and sterile, must be about the relation of God to, the creation by God of, the world which the natural sciences describe.

Christians therefore often encounter a credibility gap when making public statements on environmental matters, and are not likely to have much influence in the debate until this problem is resolved.

The inevitable starting point for any re-examination is, of course, the two creation stories of Genesis, and other relevant texts on creation theology in the Old Testament. Psalms 19, 24, and 104, and Job 38-41 contain important general statements about the Biblical attitude to nature, and the Pentateuch includes some startlingly modern-sounding specific commands. For example: Deut 20:19 prohibits deforestation as a military tactic, asking "are the trees in the field men that they should be besieged by you?". According to Ex 23:12, the purpose of the Sabbath is partly also to allow rest days for working animals. Psalm 144 denies human hubris with "man is like a breath, his days are like a passing shadow".

The Biblical world-view is very different from ours, but we must treat its message with serious, critical intelligence. As Hall (1986:174) points out,

We can hardly expect the Biblical authors to have spoken directly to the crises we confront. They did not have to deal with a beaten natural world, or

with human beings whose technical genius had brought them to the point where they can destroy trees not only with axes, one at a time, but with acid rain, from afar, and by the millions! The remarkable thing is that there is as much as there is in this ancient literature by way of compassion for nature and the recognition of human solidarity with it.

Hall adds that one of many problems associated with using the Biblical evidence is that it "...already participates in the 'ambiguity' [about nature] that has typified the history of Christendom" (as comprehensively documented by Santmire 1985). But beneath the multiple witness and the historical context of the Bible there are deeper strata of Biblical faith, and the recovery of them is one of the primary tasks of critical and constructive theology in modern times.

8.2 The classic Christian doctrine of creation

All images and ideas about creation are necessarily shaped by the contemporary knowledge and experience of those who formulated them. The authors of the Biblical creation stories, the ancient Hebrews, worked in a cultural milieu dominated by the mythologies of Egypt, Canaan, Assyria, Babylon and Persia. Through interactions between these traditions, going back to the fourth or third millennia BCE, the Hebrews developed their fundamental conviction that creation is to be understood in terms of

the unique sovereignty of Yahweh, the God of Israel, and the complete subservience of all nature, both in heaven and earth, to ... a single code of law which was established along with the universe at the beginning of time (Kaiser 1991:6-7).

The Hebrews' faith in Yahweh ("the God who creates continuously") was forged out of their belief, largely influenced by their experience of the Exodus, that the God of Abraham was stronger than the gods of their neighbours. During the exile, they developed a wider understanding of the whole world as radically dependent on a constant upholding by divine action (Anon 1994: 6). They believed that the only reason that the universe exists is that God delights in it for itself and positively wants it to exist - and if God were ever to cease upholding it, there would be nothing. As Cupitt (1984:57) put it

the idea of Nature as a whole, which we owe to the Greeks, they [the ancient Hebrews] simply lacked. Where we see a natural world they saw the effects of the activity of God....all things revealed God, as drapery reveals the movement and activity of the body inside it.

For the Hebrews all discussions of creation concerned a practical and ontological, not a temporal, question, about how things are, not about where they came from. To the Hebrews,

the origin of the universe was beyond human understanding... but its subsequent operation can be understood due to the fact that human reason is in some way a reflection or image of that same lawfulness or reason that governs the world (Kaiser 1991:6).

The historic (Biblical) creationist tradition is therefore far older and more fundamental than the recent concept of "creationism" espoused by modern fundamentalist sects, and the two have very little in common. Kaiser (1991, 1993) summarises the three main themes of the historic tradition as:

- (1) the natural world is orderly, comprehensible and accessible to human understanding;
- (2) contrary to previous ideas, heaven and earth are made of the same sorts of matter;
- (3) nature is relatively autonomous, operating according to self-sufficient laws.

It is of course essential to be careful when making comparisons over vast spans of time. Not even Biblical doctrines behave as constants, unchanged over thousands of years. Substantial shifts in the primary emphases of Old Testament creation theology were introduced over later centuries.

First, the New Testament writers worked in a totally different setting from that of the Hebrews, dominated by Hellenistic, Egyptian, Syrian and Iranian cultures. Much of the other-worldly attitude that has shaped the Christian response to nature is an import from Greek philosophy in New Testament times (Santmire 1985); hence, the New Testament scriptures are much less earthy than the Hebrew.

incorporated into church doctrine until the end of the second century AD (McGrath 1994:234). None of the great prophets and wisdom writers of the Old Testament were aware of it, although it became very influential in the Hellenistic world of the New Testament. It so happens that the Priestly creation story in Genesis 1 is broadly compatible with contemporary scientific cosmology, which sees the origin of the universe in the so-called "Big Bang", but that is not the point of P's story. Neither does such a simplistic interpretation do justice to the range of models of the relationships between the human and natural worlds employed by Biblical writers in different times and historical circumstances (Simkins 1994:255).

Unfortunately, during the course of history the balance between the two interlocking aspects of creation theology, concerning origins versus dependence, became lost. By at least the end of the eighteenth century (Berry 1995:21), and certainly by Darwin's time, Christian creation theology was emphasising the idea of an original act, the *beginning* of life, much more than that of a continuing process of upholding the *ongoing conditions* for life. That distortion of the Biblical insight caused great problems for Darwin, and eventually it helped to undermine his faith, as it still does that of many young people brought up in modern Christian homes.

The significance of the difference between the concepts of dependence and origins in creation can be illustrated by analogy with a television drama. What viewers see is the joint work of the author of the script, the director, the actors, the production crew, and the developers and manufacturers of the transmitting and receiving technology. The origin of the play can be analysed in terms of all their different contributions, and that would certainly be a complex enough task in itself. But ultimately, all these participants in the chain of events, as well as the viewers themselves, are dependent on a steady supply of electricity that is taken for granted and yet can be interrupted at any moment - and when that happens, everything stops. The electricity does not itself directly create the play, any more than God directly creates blackbirds probing a lawn for worms, but it constantly upholds the conditions under which all the complex work of organising the writing, performing and enjoyment of television plays can be done. Independent human actors and playwrights can do their creative work well only when they are free to assume that the power that brings their productions to life will always be there, as God constantly upholds the conditions permitting all the multitudinous and unconscious activities of blackbirds, grass and worms.

8.3 Creation theology and the origin of modern science

Unlike most other cultures of their time, the Hebrews insisted that trees, rivers and rocks did not have their own resident spirits, but that all matter was merely matter, open to human use and investigation. Christian creation theology inherited this attitude, and is therefore seen to have been responsible for a systematic, historic campaign to demythologise nature. White (1967) severely criticised Christianity for this doctrine, on the grounds that it removed the protection that superstition had once afforded the natural world, and opened the way to the unrestrained exploitation that has produced the modern ecological crisis. Yet that very same demythologising doctrine also laid the foundations of modern science.

The scientific view of the rational, ordered universe is entirely compatible with the theistic, Christian affirmation that we can make sense of the world because God's faithfulness stands behind it. The three main themes of the historic creationist tradition, asserting that the universe reflects the goodness, rationality and freedom of God and therefore creation itself must be good, rational and contingent, were in due course incorporated within Christian faith.

Christianity was therefore open to science from the beginning, and this indeed is one of several reasons why the roots of modern empirical science are deepest in the Protestant Christian west (Wolpert 1992: 46; Barbour 1997: 28). Other cultures had developed systems of organised knowledge over many centuries, but no ancient science produced western-style, experiment-based technology. The Greeks were hampered by the Platonist view of all matter as inferior embodiments of pure rational forms, so they believed that experimenting on them would be pointless. The Chinese had no geometry, and their holistic view of life precluded the development of the reductionist analysis required to develop technology (Wilson 1998). Religious authorities in Roman Catholic and Islamic countries, and state officials in China, exerted tight control over higher education (Barbour 1997: 27); in contrast to the intellectual freedom of western universities, especially Protestant ones.

For Newton and many other early members of the Royal Society in London, science was a means of reaching out to God. The three theological concepts of goodness, rationality and contingency are among the vital foundations of science. If the universe is good, it is worthy of careful study; if it is rational, it is predictable and reliable; and if it is contingent it could have been otherwise than it is, so the state of things has to be

studied by experiment, not deduced from pure reasoning. Moreover, the Hebrews insisted that there had to be a fruitful balance between the rationality and the freedom of God in creation: if rationality is overemphasised, the universe becomes fixed and uninteresting, whereas if freedom is overemphasised, the universe becomes incoherent, unpredictable and impossible to study.

In a nutshell, if the world is not rational, science is not possible; if the world is not contingent, science is not necessary (Newbiggin 1986:70). The Christian theology of creation claimed that it is both. Thus the historical relationship between theology and science in the western world has been very much more long-standing, complex, productive and positive than many participants in the present debate may realise. On the other hand, Christianity should not, and does not need to, defend itself by claiming credit for having contributed to the rise of science, which would expose it to the developing contemporary backlash against the excesses of scientific technology. The most it need claim is that true Christianity is not, and never has been, incompatible with true science (Peacocke 1979:76, Ward 1996).

C.S.Lewis neatly illustrated this compatibility when he put into Screwtape's mouth the advice (to a young devil attempting to ensnare an unsuspecting human soul),

Above all, do not attempt to use science (I mean, the real sciences) as a defence against Christianity. They will positively encourage him to think about realities he can't touch and see. There have been sad cases among the modern physicists. If he must dabble in science, keep him on economics and sociology (Lewis 1942: 14).

Sound advice indeed - and in view of the diabolical consequences of modern market economics (S.4), one might deduce that Screwtape's pupil has been remarkably successful in following it.

Since Biblical times, according to Moltmann (1985: 33-34), the relationship between the doctrine of creation and science has passed through three distinct stages.

1. During the first stage, Biblical traditions and the ancient world's picture of the universe were fused into a religious cosmology emphasising a divinely ordered world filled with God's glory and guided only by divine wisdom. The consequences of this doctrine for the attitudes of ordinary people to the animals and plants around them

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have been well summarised by Thomas (1983). This stage has no modern equivalent except among extreme literalists.

2. The second stage began when the sciences emancipated themselves from this cosmology, while theology detached its doctrine of creation from cosmology and reduced it to a personal belief in God as Creator rather than in the things that have been created. The two disciplines established, after many struggles, their own identities on either side of accepted demarcation lines, and achieved a peaceful co-existence based on mutual irrelevance. This stage is roughly equivalent to that of Barbour's Independence (S.1.5.2).

3. In the third stage, which we are just entering now, the sciences and theology are becoming companions in tribulation, under the pressure of the ecological crisis and the search for new directions in both which must be found if humanity is to survive at all. In this newly co-operative atmosphere, the mutual demarcation lines are no longer necessary. In a global situation where it is one world or none, says Moltmann, science and theology cannot afford to divide up the one, single reality. His view is confirmed by the success of the Templeton Foundation in stimulating intellectually rigorous tertiary courses in science and religion (almost 400 have been funded to date).

Many academics and students now see the two disciplines as partners to be taken seriously. This stage includes Barbour's Dialogue and Integration (S.1.5.3-4), and it brings great hope for the future. Allied with science, there is every reason to hope that Christianity can make a useful contribution to the environmental debate. Science emphasises the dynamic aspect of creation which theology had temporarily forgotten, and at the same time is raising all sorts of questions which are outside its own province to answer. For example, modern medical science encounters many life-or-death dilemmas in which science and ethics cannot avoid meeting: and the solutions are often rooted in the Judaeo-Christian tradition. After discussion of other relevant issues, contemporary developments in creation theology are reviewed in S.10.

8.4 What is “the integrity of creation”?

The concept of the “integrity of creation” introduced at the 1983 Vancouver Assembly of the WCC was new and not well defined, but generally agreed as having implications far beyond the earlier idea of sustainability (Gerle 1995:47). To some,

its very novelty was an advantage: one participant in a discussion of what it might mean commented, with some exaggeration, "Thank God the ecumenical movement has finally given us a concept without content so that we can put into it what we want to!" (Niles 1989:58). To others, the concept of the integrity of creation is too indefinite to be at all useful - the German delegates at Vancouver declared that it is untranslatable, and the Basel conference avoided the term altogether (Gosling 1992:9). A scientist wants to know what a theologian understands by it, and further, what "safeguarding" it means - from whom or what does it need safeguarding, and why?

The original meaning of integrity, as understood in the Hebrew scriptures, was primarily a matter of relationship to God and adherence to God's laws. The integrity of nature consisted in the fact that it had never disobeyed God; nature was always and still is perfectly obedient to God, so if any part of nature was hostile to humanity after the Fall, that was because it was being used as a means of conveying divine judgement on humans (Kaiser 1996). If we have lost this sense of the integrity of creation in modern times, or act as though it did not exist, that is *our* problem, says Kaiser: a problem with our concept of creation, and underlying that, a problem with our concept of God. He agrees with Pagels (1988) that the later Christian ideas, that the fall of Adam necessarily involved the corruption of the whole natural world and therefore that Creation needs redemption as much as humanity, are simply wrong and are to be discarded.

It is a surprise and a relief for a biologist to be assured by theologians that the Hebrews understood that thorns and thistles are an integral part of God's creation, and that it is only their *presence* in tilled fields that made them a curse to the Hebrew farmers, not their own characters; that only arable land was cursed, not all of wild nature; that if there was a conflict between God and Israel, nature was on God's side; and that the groaning of the earth whilst waiting for the sons of God to appear was less about loss of integrity than a poetic image concerning the corruption of bodies in their graves. These concepts translate much more readily to the modern mind than the fantastical Greek ideas that came to overlie them in New Testament times. Kaiser completes his reinstatement of the original and far more contemporary-sounding and satisfactory meaning of the phrase by putting humans in their place:

The integrity of nature.....is not something humans can either contribute to or detract from....if we fail to respect [it], we will certainly bring ruin upon

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ourselves.....but the order of nature - as understood in Scripture.....- owes no more to human participation than it does to any other species (ibid :290).

In other words, the Biblical view is that creation needs safeguarding from *humanity*, because of the two, only creation retains its original integrity intact.

Within WCC, the idea of the integrity of creation has proved useful, for two reasons summarised by (Niles 1989:58). “First, *it has given a new prominence to the doctrine of creation*”, understood as the rather difficult theistic* idea of a continuous and continuing divine upholding of all life, rather than simply as the deistic* idea of “the initial divine act which set nature and history on their course” (S.4.2). Second, since the Biblical idea of the integrity of creation refers to much more than ecological issues, it offers a context for our struggles for peace and justice. Hence, the new term “integrity of creation” is widely understood to mean that there is a “moral order given in creation that we disregard or violate at our own peril.....*moral value or worth [is] something the Creator has bestowed on the whole of creation*³¹ and not just on the human part of it....”(Niles 1989:59). The natural inclusiveness of the concept that creation has its own integrity provides a theological means of holding together the issues of justice, peace and environmental management.

At Annecy, in France, a meeting on theocentric ethics in September 1988 (Birch, Eakin, and McDaniel 1990:277) agreed, after extensive discussion, on a working definition:

The value of all creatures in and of themselves, for one another, and for God, and their interconnectedness in a diverse whole that has unique value for God, together constitute the integrity of creation.

The emphasis of this definition appears to be upon creatures as individuals, which is understandable from a theological point of view, but it is likely to run into difficulties when conflicts arise between the good of the individual and the good of the ecosystem. For example, what happens if deer, seen as “creatures of value in and of themselves”, become so abundant that they cause damage to their habitat, which presumably is included within the idea of “a diverse whole that has unique value for God”? In such a situation, which is common in parts of Scotland, New Zealand and

³¹ This concept is treated at much greater length by Murphy & Ellis (1996)

US, the two sets of values are incompatible. Which of them is to be sacrificed for the other?

For Aldo Leopold, widely regarded as the father of wildlife conservation in USA, the answer is clear. He was a hunter and woodsman of great skill, and in *A Sand County Almanac* (Leopold 1949), he advocated the view that, when necessary, the individual must be sacrificed for the ecosystem.

All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts... The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land (pp. 203-04).

A land ethic of course cannot prevent the alteration, management, and use of these 'resources', but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state. In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such (p.204).

A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise (p.224-5).

What Christians need is a concept of the integrity of creation that transcends the static and simplistic theological idea of "wholeness", or even "telos": one that does justice both to (a) the restless dynamism of the real natural world recognised by science, and to (b) the real conflicts of interests between individual and community at all levels of nature. There is little recognition of that need so far. For example, in early 1988 a large meeting of the WCC on the theme of JPIC was held at Granvollen, Norway. Michaelson (1994:99) commented on the extent of the agreement among participants on the central ideas, including that "Every creature and the whole creation in chorus bear witness to the glorious unity and harmony with which creation is endowed". Such a perspective would sabotage any prospect of co-operation with evolutionary biologists on environmental issues. Likewise, Richard Randolph, of the Centre for Theology and the Natural Sciences, expounded to the 1998 Templeton conference in Berkeley the ethical idea of encouraging the "flourishing" of natural systems as a theological aim. California is as much altered by the flourishing of introduced species as is New Zealand, which he freely granted, but he had no precise

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answers to the question of how we should distinguish between flourishing pests, to be controlled, and flourishing native ecosystems, to be encouraged.

It is important and encouraging to note that Leopold's secular definition of the integrity of "the biotic community" , Annecy's theological idea of the value of "a diverse whole that has unique value for God" , and JPIC's term "the integrity of creation" all avoid the anthropocentric term "environment" - always taken to mean the environment of humans. The creation that we are concerned to care for, or at least to avoid damaging, has its own life and values, and is far more extensive than the human environment - it existed long before we evolved, and in vast areas of ocean, mountain ranges, deserts and tundra it still survives independently of us. Recognition of this is a real contribution to contemporary culture (Gerle 1995:117). Nevertheless, secular literature (i.e., most literature) is primarily concerned with the human environment, and, as it provides an important resource for this study and its focus cannot be changed merely by inserting a different terminology, I have continued to use the term as generally understood.

Gosling (1992:10) points out that "integrity" is a *relational* word, with both vertical and horizontal dimensions. Theologically,

integrity of creation implies both the vertical dependence of creation on its Creator and the worth and dignity of creation in its own right (i.e. its intrinsic value)...[horizontally], every creature is bound to every other creature in a community and communion of being. Human beings especially must recognise that we are not separate from and above the rest of creation, but part of its totality, sharing with other living beings their limitations and destiny.

Such a concept is already there in Leopold's definition, but is new to mainstream Christianity, and if accepted would entail a huge revision of many ancient theological convictions concerning the dignity of humanity. Even in the secular world, it would meet a great deal of resistance (Text Table 3).

9 BIOTHEOLOGY: STUDYING THE LINKS AND PARALLELS BETWEEN NATURE, HUMAN SOCIETY AND RELIGION

In biology, the Darwinian theory of natural selection has survived continual testing for almost 150 years. Its (much older) equivalent in Christian religious life is the New Testament, the first of many theories in Christian theology, drawn up by those who struggled to understand the impact and consequences of the Incarnation. At the interface between the two is a whole new subject, that seeks to understand how each of these hitherto independently developed bodies of ideas can illuminate each other. In 1990 I coined (or so I thought) a name for it: biotheology. Six years later I attended the 1996 IRAS annual conference on Star Island, and met there Michael Cavanaugh, whose book *Biotheology: A New Synthesis of Science and Religion* (1996) was already on sale in the conference bookshop³². Cavanaugh's definition of biotheology is uncompromising: he sees it as an attempt to "make theology plausible again, by placing it on the strong foundation provided by modern biology" (p. 3). I am uncomfortable with the implication that biology could be in a position to make such a simple judgement, or to demand that theology change to meet its standards – such a one-way process does not sound like the integration we need. But elsewhere in his book Cavanaugh makes many valuable comments, which I have referred to where relevant.

³² If Cavanaugh had not been so charming and generous, when we discovered the coincidence in our thinking, I would have been far more down-cast than I was. His ideas are in some respects parallel to my own, which had been developing quite independently, except that his work has a different flavour due to his background (he is a lawyer by training), and his coverage is less directly relevant to the Fifth Mission Statement. Since then I have discovered that many other authors have come to comparable conclusions from different directions, and I take that as encouraging confirmation that we are all on the right track. Meanwhile I retain the use of my term "biotheology" as an independent – though not unique – product of my research, and I here use it according to my own definition.

9.1 Pilgrim's Progress: from natural selection to abandoning all selection

The basic premise of biotheology is that there are links and parallels between the natural, human and religious worlds which can validly be used to expand our understanding of all three. Individual human beings are free to move between the three worlds, and to choose which one they will inhabit for most of their time. The three worlds overlap, and the interactions between them, and more importantly between the different processes active within them, explain many of the conflicts that we all experience (Fig 3).

A good metaphor illustrates both the similarities and the differences between the known and the unknown (McFague 1987). The *basic similarity* between the natural, human and religious worlds is that all three operate on the same principle of variation between characters, selection and preservation of the most useful or appropriate variants, changing frequency distributions of the variants from one generation to the next, and consequent adaptation to a better fit with reality. With respect to the natural and human worlds, this is not a controversial contention. With respect to the religious world, it is rather more debatable, but the concept has been developed in some detail by Gerd Theissen, a theologian of considerable stature³³ (Theissen 1984).

The *basic differences* between the three worlds concern the form of the units of inheritance and the action of selection upon them. The natural world is ruled by natural selection alone; the key feature that sets apart the human world is the interaction of natural selection and cultural selection. In Peacocke's (1993) phrase, the interplay between chance and law influences history in both the natural and human worlds. Time's arrow runs only in one direction; certain choices preclude others, events follow each other in irreversible order, and earlier achievements tend to be enfolded into later organisations (Barbour 1997:238). The key feature that sets apart the Christian vision

³³ Again, in 1998 I found myself torn between despair and affirmation to discover that, although I had worked out what I had believed to be my own entirely original insight (written in 1994-5) into the application of Darwinian processes to religious history, a close parallel had been published years ago (Theissen 1984). Fortunately, Theissen's discussion covered different aspects of the comparison from mine, and in very much greater depth, so again, I have been able to recognise his priority and incorporate into my draft many improvements suggested by his book whilst at the same time retaining my own original analysis of the action of cultural selection in shaping particular details of Christian doctrine and history.

as a distinct subset of the religious world in general is that Christianity takes very seriously the aim to replace all forms of selection by the idea of all-inclusive acceptance of all variants – expressed most basically in the supreme commandment, “Love one another”. There is simply no natural equivalent to that, nor could there be, by definition of the way evolution works (Appendix Table 2). All other religions are concerned with selective rules of inclusion and exclusion: therefore, says Capon (1983), Christianity is not a religion: it is the announcement of the end of all religion.

Human society and human understanding of God have developed gradually from the ethnic period of tribal religions, through the transethnic period³⁴ of the major world religions (Jaspers’ “Axial Phase”:Barbour 1997:266) to the present global and secular period of modern spirituality (Geering 1994). Historians are familiar with such transitions. Religion has long been recognised as having an important function in human evolution, contributing both stability (in Durkheim’s view) and change (in Weber’s view) (Barbour 1997: 267), the difference presumably determined by the current relationships between religious and secular authority. That relationship is more distant these days than it was in tribal societies, but even now, many people would disagree that religions are merely cultural adaptations that had survival value the past but become maladaptations when they persist into the present (Austin 1980, Burhoe 1979).

Steering the middle course, biotheology focusses on the point that the church is, on one level at least, a human organisation competing with others for adherents. In human life as in nature, competing groups tend to develop collective properties of their own, and these properties are favoured by cultural selection if they favour the interests and cultural adaptation of the group, and rejected if they do not. It would be astonishing if this process did not ensure, among these emergent properties of Christianity, the recurring tendency to shape its message in ways that would favour its own survival. History charts the record of its successes and failures in this, just as evolution charts the successes and failures of animal adaptation. Both have left a trail of fossils buried in datable strata, and the present forms of both reflect the history behind each lineage.

³⁴ The transethnic period of religious history, when three independent traditions made the breakthrough to monotheism, also coincided with the Pre-Socratic laying of the foundations of modern science (Theissen 1984:37).

Acceptance of this analogy does not imply, however, that religion is either *merely* a survival mechanism for individuals, or *merely* a cultural unit with collective interests of its own. It could also represent a real human response to a transcendent reality. Like the hermit crab, it is easier to define its visible appearance and behaviour than the invisible life that animates it. There are, obviously, both similarities and differences between natural and ecclesiastical history, but to the extent that the analogy is apt, it could lead to previously unsuspected insights into familiar scenes.

9.2 The triple worlds analogy

Darwinian biology has had spectacular success in understanding the workings of both natural and secular worlds, but the religious world is usually regarded as closed to inspection by natural selection. My contention is that Darwin's insights are very relevant to understanding the world of religion too.

Cultural tradition once interpreted how things were and which things mattered through a narrative myth* accepted by all members of the group (Rue 1989). A myth presents in story form a summary of how a society understands its world, especially its place in the cosmic order. It serves to integrate a society and to induce a match between behaviour and ideals both in individuals and in groups. Among the many functions or consequences of traditional religion was the reinforcement of the local mythical interpretation of reality and the moral sanctions arising from it, which in turn were reinforced by deep emotional imperatives such as love, loyalty, gratitude and so on, that favoured the social bonds promoting survival of the cultural group (Austin 1980, Burhoe 1979). Because the word "myth" has changed its meaning in our culture, I will follow Barbour's lead in preferring the phrase "sacred story" (Barbour 1997: 265).

The integration of sacred stories with social rituals, developed together over thousands of generations, produced what Brian Swimme³⁵ calls "microphase wisdom" - an integrated set of physical and cultural adaptations that allowed tribal peoples living in small, local communities to maintain social cohesion and to make sense of their lives. Tribal property was communal and managed with the help of long-established rituals;

³⁵ The differences between "micro-phase" and "macro-phase" wisdom were among Swimme's themes at the 1996 IRAS annual Star Island conference on "The Epic of Evolution".

stratification of society was minimal; and the opportunities for individuals to make a personal profit were limited by intense social scrutiny. Such people were not adapted to, never encountered, and could not imagine, the environmental dilemmas that face modern human society.

The other side of the coin is that many forms of religious traditions have evolved separately, all under the powerful influence of cultural selection acting on groups. Regrettably, conflicts between human groups are virtually inevitable, for reasons discussed in S.6. The opposite pulls of co-operation within a group and hostility between groups, both favoured by the reciprocal altruism that is such a powerful component of cultural selection acting on the group, defines the zone of conflict between competing groups, especially competing religious groups, within the human world: Various forms of tribal warfare, often but not necessarily linked to some sort of religious intolerance (Martin 1997), have dominated human history from Canaan to Northern Ireland.

But there is a huge difference between religion, defined as a human social construct, and spirituality, defined as a vision of faith (S.1.3.2). The religious world is also inhabited by people who have caught a glimpse of the unseen reality of God – or, as many would rather say, by people who have *been caught* by God. They realise that, to be like God and to reach the highest pinnacles of the human spirit, it is not enough merely to limit our self-interest. We must learn to let God teach us how to abandon it altogether. We must complete the transition from natural selection of *personal* advantages, through cultural selection of *group* advantages, to the total surrender of *any* advantages in self-offering faith. That is extraordinarily difficult, because it is dangerous and totally unnatural. The animal side of our nature is totally opposed to it, and for very good reason. People who try it are often regarded as religious maniacs, even by their friends and family – as Jesus himself was (Mark 3:21). Jesus recognised that such a degree of self-abandonment would be a form of death - we must cut ourselves off from our native animal background and enter a new life or, as he put it to Nicodemus, we must be born again. Such a radical step is possible only for those who have total confidence in God, and a certain independence of other people's opinions. The opposite pulls of self-interest favoured by natural selection on the individual, and social integration favoured by cultural selection on the group, defines the zone of conflict between the natural and religious worlds (Campbell 1975).

The total abandonment of our self-interest is hard and unnatural, so in normal life we construct all sorts of defences against the challenge it poses. Yet those who can discipline their own evolved defences also become aware that the three interacting

visible worlds are enfolded within an even larger but invisible spiritual world, the presence of God. The grace that holds all reality together is like the sun which, said Jesus, the Father makes to rise on the evil and the good, and the rain which falls on the just and on the unjust (Mat 5: 45).

Biotheology explores the proposition that Darwinian processes offer many insights into Christian theology. The two fields of greatest interest are history and doctrine, as discussed separately below.

9.3 The books of life in a new translation: Darwinian commentaries on nature and Christian history

From earliest times and throughout Christian history, two sources of spiritual instruction have been acknowledged; the book of the world of nature, and the book of the word of scripture.

All books, indeed all our daily experiences, can be understood only when they are set in the context of previous knowledge, which itself is organised in our minds in terms of some unifying model or theory that provides meaning and defines truth (S.1.6). For example, Jesus' experience of God as a compassionate father figure preceded and informed his public teaching ministry. He taught from nature by induction (from the particular to the general), starting from the known particulars of the natural world of his hearers, and leading to a previously unknown and general message about an accessible, loving and forgiving God. He talked about the natural beauty and value of wild lilies and sparrows to people who possessed nothing of value, and who felt that they were themselves devalued by the legalistic tone of contemporary Judaism and the contempt of its leaders for those who failed to keep the Law.

In a society where agricultural work was part of daily life, Jesus built his teaching on common knowledge, such as that vineyards have to be regularly pruned to make the best branches bear more fruit while the cut ones immediately die and are burnt. For the early church community, the parable of the vine and the branches was a very precise image of the fulfilment to be sought in community membership and the dangers of separation from it. The parable of the sower is not only an accurate and rather wry observation of the fact that, in those days of inaccurate broadcast sowing and minimal fertilisation of rocky soils, not all the seeds sown actually produced a

crop. It is also an explanation, helpful to missionaries of all generations, of why different people react differently to their message. Preachers have used images from nature ever since, from Paul's analogy of the church as the body of Christ, through Patrick's use of the shamrock to illustrate the Trinity, to frequent contemporary sermons.

Yet non-religious writers, working from within an entirely different paradigm (Barbour 1997:125-7), have no problem finding counter-examples from nature to support *their* contention that there is no God, or at least, that any God that might exist could not be much like the one proclaimed by Christianity. They too start from particular examples known to them from their daily work, but they arrive at very different general conclusions. For example, Gould's essay *Non-moral nature* (Gould 1983b) is a detailed description of the less savoury habits of the ichneumid parasitoids, a large group of solitary wasps. The female wasp inserts her eggs under the skin of a caterpillar, which then hatch and develop into grubs that slowly eat their victim alive from the inside. Gould uses them to promote his own atheism, declaring that such unpleasant animals directly contradict the old idea of a perfect creation made by a benevolent God. And Richard Dawkins' systematic demolition of William Paley's natural theology in *The Blind Watchmaker* (Dawkins 1986), and his dogmatic assertion that creationism and scientific materialism are alternative, *competing* explanations of the world, have made Christian belief almost impossible for many students.

Christians have been slower to realise the implications of Darwinian biology for their world view than have non-Christians. It is not that radical reinterpretations of old assumptions are impossible within the church; even in such a conservative organisation, the charismatic movement, liturgical reform and feminism have made sweeping changes over the last few decades, for various reasons not all purely spiritual. The main trouble is that most Christians do not know enough about Darwinian biology to be able to see its implications for their faith; in addition, fundamentalists tend to fear it as a rival explanation for the mystery of life. As the philosopher Mary Midgley puts it:

People's difficulty about seeing themselves as members of the one creation has come from a crude, narrow, highly abstract notion of what the other members were like (Midgley 1978: 95).

But modern biology is no threat to “mere” Christianity, rather it is a new commentary on it - or maybe a new translation of it - just as it is also a new commentary on the book of nature. In demonstrating the interplay between random mutation and non-random selection, that is between chance and law, evolutionary theory is, in Peacocke’s expressive phrase, theology’s friend in disguise (Peacocke 1996).

The task of reinterpreting Christian history and beliefs in the light of our understanding of Darwin’s legacy is daunting, but essential. We are in the same position as the early Christians, who faced the huge job of reinterpreting their understanding of God’s actions through Judaism in the light of their experience of God’s actions in Christ. The paradigm shift required of us is profound, and somewhat un-nerving, though rather less so than that required of them. On the other hand, since the process of defining Christianity took at least the first half millenium of the common era and involved a huge upheaval and endless disputes, we should expect the parallel process in our own time also to be time-consuming and controversial. To illustrate the potential, I outline a Darwinian intepretation of Christian history cast as a direct parallel of the Darwininan interpretation of natural history (Appendix 2). Critical discussion of the potential interaction between biology and systematic theology would be another thesis in itself, but I have given the flavour of it in a preliminary summary of biotheological comments on Christian doctrine (Appendix 3).

9.4 Biotheology and Christian history

If the theory of gene-culture evolution is valid, it should be able to cast new light upon old problems that have previously been analysed only in different terms. The Christian message has been studied for centuries, yet it still raises questions that have puzzled generations of philosophers. Some of these questions are relevant to the environmental crisis, and cannot be explained by assuming that humans are rational or can learn to be altruistic. For example, “Why is it such hard work expanding the bounds of affection - loving one’s neighbours and enemies?” (Midgley 1978:344). Or, responding positively to the Seoul affirmations (S.2.2)? In this section I explore the potential of biotheology to help answer these questions, through an analysis of Christian history.

9.4.1 Genes in Biblical history

The existence of genes and their effects were not appreciated until the 20th century, but the reality and significance of heritable units of information have always been known. Biblical writers understood very well that both physical characters and ideas were inherited down family or tribal lines, and were more permanent than the individuals in whom they happened to be passing through at any one time. The Twelve Tribes traced their separate origins back to the twelve sons of Jacob, and certainly knew that the individual characters of each patriarch were transmitted through his “seed”. Indeed, all Jews thought of themselves as the seed of Abraham, and were outraged when John the Baptist suggested that God could raise seed for Abraham from stones - ie, by non-genetical means (Mat 3:9).

The Old Testament writers had clearly made the connection between the genital equipment of males (euphemistically referred to as “the loins”) and the inheritance of particular characters. In Hebrews 7: 9-10, the author refers to Abraham as being “still in the loins of his ancestor when Melchizedek met him”. The ancient Hebrews had no concept of life after death, but thought of themselves as living on in their children rather than as themselves in another world (now that the wheel of history has turned full circle, this sounds a remarkably contemporary idea). To the author of Deuteronomy, the ultimate punishment for an enemy was to make sure he left no offspring: hence he asks God to defend a good man and “crush the loins of his adversaries, of those that hate him, so that they do not rise again” (Deut 33:11). Conversely, the improving effects of breeding only from the best livestock was common knowledge, and was part of the basis for the command that only unblemished animals were valuable enough to be worthy of Temple sacrifice.

Wars in Biblical times were exercises in selective extermination; the conquered were simply wiped out, and their culture erased. The victors were likely to be the side with the largest army, which added urgency to the ancient animal struggle for reproductive success, especially the production of sons. In Num. 31:17-18, after a victory over the Midianites in which every male was killed and their women and children taken captive, Moses commands: “Now, therefore, kill every male among the little ones, and kill every woman who has known man by lying with him. But all the young girls who have not known man by lying with him, keep alive for yourselves”. The young girls were spared because they could contribute to the reproductive expansion of the victors, without contaminating Israel with the cultural traditions of their own people.

9.4.2 Memes as units of Christian doctrine

The same processes of variation, competition, and natural selection apply to memes as the basic units of cultural selection. Cultural selection causes changes in the frequency distributions of memes from one generation to the next, which in turn produces historical changes in cultural traditions, just as changing frequency distributions of genes produce evolutionary change. One of the most spectacularly successful memes (actually a “memome” - a co-ordinated set of memes) of the twentieth century is the computer programme Microsoft Windows, the basic disc operating programme used by millions of personal IBM computers. For the ordinary (non-professional) user, Windows is the equivalent for a PC of white fur for polar bears, since almost all PCs in the general market³⁶ world-wide have a copy of one or another version of it. Less successful early competitors were long ago out-competed and shut out of the market, and less user-friendly contemporary alternatives are mainly the domain of professionals. There are also real genes that have achieved such universal distribution, which, like Windows, control basic, completely indispensable background processes such as respiration and digestion. The memes for Windows and the genes for respiration remain unchanged through millions of replications, because almost any copying error is immediately fatal.

In religious life an equally spectacular example is that of the annual Passover ritual of the Hebrews, which included the solemn recital of the Exodus story specifically to ensure that it never be forgotten by any member of the Hebrew tribes whose ancestors experienced it. The preservation of this concept virtually unchanged for thousands of years is one of the best known examples of the accurate transcendence by replication of a meme faithfully copied through generation after generation of successive human minds across immense spans of time.

In science, it is now possible to document the spread of, say, the central idea of a published paper, from the cumulative number of later authors who cite it, as listed in the Science Citation Index. If one quote is taken as one generation, the fitness of that particular meme can be quite precisely measured. Chain letters serve the same function for sociologists (Goodenough and Dawkins 1994).

³⁶ Computer professionals often disparage Windows, and there is a very widespread distaste for the heavy-handed business tactics of Microsoft that are responsible for its overpowering market dominance. A rival product, Linux, is as yet too user-unfriendly to count as a serious challenge to Windows, but that could change in future.

Just as there is a fundamental difference between a set of genes and the body constructed from it, so it is possible to postulate a difference between a set of memes and the doctrine or religious organisation constructed from it. And, just as with genes, that basic insight can be interpreted in several ways. The selfish-gene metaphor (S 6.6.2) is a controversial interpretation of physical evolution from the gene's eye view, well developed now and useful to a point but not widely accepted in its application to human life. Inevitably, theories have been developed postulating that memes too have lives of their own, and the power to turn us into robots, in Dawkin's phrase. Memes are seen to be like viruses infecting human minds, just as computer viruses infect computers. In its most extreme form, the new science of "memetics" is being hailed as an exciting new branch of psychology, which casts new light on the age-old question of the identity of the self. Perhaps, after all, there is no such thing; our "self" is just a "ragbag of replicating mind viruses and genetic predispositions that conspire to create the twin illusion of free will and mental coherence" (Editorial, *New Scientist* 13/3/99). The old ideal of a moral universe is already shifting, as people start to blame their transgressions on their genetic makeup. How long will it be, asks the editorial, before it breaks down completely, and criminals will be able to blame their memes?

In my view, the concept of a meme is a useful metaphor, no more. I see no reason why an extreme, deterministic version of memetics disproves the idea of a meme any more than the parallel version of genetics disproves the existence of genes. The actions of both are surely a lot more complicated than the simplistic manipulations envisaged by Dawkins or Blackmore (1999), but neither is that a reason to reject the concept outright. In what follows, I accept memes as units of cultural information, but reject the implication that the existence of memes invalidates the concept of a self capable of making moral decisions.

Successful memes or groups of memes operating in a stable habitat (ie, a conservative society) in the world of religion can help maintain foundational doctrines for centuries with only gradual change. For example, the doctrine of creation has survived in various forms with only slow changes over some 2500 years, as summarised in S. 8.2. Some meme complexes are highly successful, such as the Exodus story, but they are rather few; most never "catch on" and are soon eliminated or forgotten. On the other hand, a sudden habitat change or increase in variation in ideas must have the same effect in the world of memes as it does in the world of genes. There was such a change in the environment of religious ideas in Judea during the first century AD, and the consequence was a significant shift in the regime

of selection between competing variant memes. For the early Christians, new memes such as the concept that Jesus was the long-awaited Messiah, came to modify or replace old ones, such as that the Messiah was going to be a military hero who would evict the Romans and restore the throne of David. The new memes were in time formed into new doctrines, and, after many battles with those who disagreed, eventually to a separate movement supported by those who accepted the ideas surrounding the declaration of Jesus as the Christ as more true (ie, a better route to salvation) than the alternative ideas maintained by traditional Jewish faith.

Unsuccessful religious ideas are usually called heresies by their opponents and, in former times at least, many were effectively eliminated. Hence oppressive papal authority was ejected from England, despite numerous excommunications imposed on individuals by Rome. Some religious doctrines have simply died out because times had changed and they became no longer widely acceptable, such as the sale of indulgences; others would have shared the same fate if they had not been deliberately preserved by a few, such as the Tridentine Mass.

9.4.3 Variation

The processes of mutation, recombination, competition and natural selection make short-term variation in any lineage of animal life and in human ideas inevitable. Hence, the survival of any pure-bred pedigree lineage depends on minimising that variation. Contrast the huge range in size and shape of mongrel dogs, which breed whenever and with whomsoever they can, with the standardised pedigree dogs whose ancestral breeding history was controlled by, and known to, the breed kennel club. The same applies to the variety of popular ideas propounded by newspapers and magazines, compared with those of professional journals which are controlled by the peer review system – and likewise for any religion based on an inherited set of orthodox laws and doctrines.

The stud regulations of a kennel club enforce a set of ideals defining a particular breed of dog. Developed over a much longer span of time, the huge volume of Pharisaic additions to the Torah were intended to enforce the uniform interpretation and practice of Judaism. Some of the odder provisions of Mosaic law can be seen to have been rooted in the fear of variation and its effects on the national ideal of purity: for example, in Lev 19:19 appears the command “You shall not let your animals breed with a different kind; you shall not sow your field with two kinds of seed; nor shall you

put on a garment made of two different materials". The implications of this principle for national survival were made quite explicit by Ezra 9:2: "For they have taken some of their daughters as wives for themselves and for their sons. Thus the holy seed has mixed itself with the peoples of the lands".

Even the noble House of David did not live up to the expectations of the Judean people, or of God, for as long as expected. Solomon confidently prayed: "Therefore, O Lord, God of Israel, keep for your servant my father David that which you promised him, saying, 'There shall never fail you a successor before me to sit on the throne of Israel, if only your children look to their way, to walk before me as you have walked before me'" (1 Kings 8:25). Unfortunately, the later kings of David's line ignored the conditions attached to God's promise. For example, Jehoiakim was extravagant, impious and a puppet of Egypt. God duly removed his inheritance: "Thus says the Lord: Record this man as childless, a man who shall not succeed in his days; for none of his offspring shall succeed in sitting on the throne of David, and ruling again in Judah" (Jer 22:30).

So many Israelite kings failed the same test that the prophets eventually despaired of any human king meeting the conditions attached to God's promise to David. They began to look for a supernatural solution to the problem: "In those days and at that time I will cause a righteous Branch to spring up for David; and he shall execute justice and righteousness in the land" (Jer 33:15). Ultimately the early Christians interpreted that ancient prophetic hope as fulfilled in Jesus: "He will be great, and will be called the Son of the Most High, and the Lord God will give to him the throne of his ancestor David" (Luke 1:32). With our longer perspective of history and of Darwinian biology, and our experience of Christian grace, we might disagree with the judgemental Biblical view that attributed the failures of the Davidic kings to sin. After all, they are not alone: all 5000 feudal knightships listed in the Domesday book are also extinct (Jones 1996:90). It was human genetics, rather than God, that thwarted Israel's hopes for the eternal success of David's lineage.

9.4.4 Competition

The ideas that succeed in competition with each other are the only ones that are perpetuated into the next generation. We certainly know that variation and competition were very severe in the early church, as the complicated history of, for example, the Gnostic, Arian and Pelagian heresies shows. Not all the ideas that

jostled for acceptance in the early church survived equally well. The eventual triumph of orthodoxy was the result of the differential survival of one set of ideas at the expense of another set. The canonical gospels can be called more fit than the apocryphal ones, both in the critical sense that they were judged more fit to carry the message, and in the biological sense that they achieved a higher rate of fitness (copying) in the following generations.

In Christian history there has been plenty of competition between different doctrines, for example at the great councils of the Patriarchal period, and among the multitudinous sects of post-Reformation Protestantism. One of the most significant contests, whose outcome has had incalculable effects on the western church and thereby on western civilisation, was the one between eastern and western concepts of original sin (Pagels 1988). If the influence of Gregory of Nyssa, Julian and other eastern theologians had prevailed, rather than that of Augustine, the west might have been spared centuries of tragic misunderstandings of the nature of evil and of human sexuality (Hick 1977, and see Appendix 3).

According to Pagels, one of several reasons why Augustine's theory of the Fall eventually triumphed was that it made palatable the uneasy alliance between the Catholic church and Roman imperial power (ibid:126), and it gave the church a monopoly on forgiveness of sin (ibid:p. 145). The latter argument was especially useful in serving the corporate survival (ie, the self-interest) of the church. Augustine had many opponents, but at a time when the most pressing question of the moment was the urgent need to make sense out of the new interdependence of church and state (Kee 1982), Augustine's theory had the vital competitive edge.

Competition between ideas in the human world is very real, and our understanding of reality does not necessarily progress from the simple to the complex. For example, Christians of a fundamentalist bent tend to favour the idea of returning to what they suppose was the simple form of earliest Christianity. Yet there was far more variety of belief among different Christian communities in the first four centuries than in the next thousand years (McManners 1992). Gradually certain views became standard - and, in due course, enforced, as ecclesiastical authorities became powerful enough to eliminate the rich variety of early beliefs and establish uniformity within the church.

As in the natural world, there has been plenty of predation on, by and within the church, which inevitably influenced the pace of evolutionary change. Persecution of the infant church by the Romans helped to develop the eschatological doctrines that

still survive in Christian thinking today. The Crusades might have started with noble ideals, but they turned into systematic predatory raids into foreign territory of which any hyena might be proud. They also opened the door to a turbulent cross-fertilisation with eastern culture which transformed western Christendom and led directly to the Renaissance. And just as in nature, altruistic groups are always vulnerable to parasites, from simple free-loaders to corrupt administrators and embezzlers. One of the clearest New Testament examples is the story of the attempted fraud by Ananias and Sapphira (Acts 5:1-11). And as for mimicry, the natural world can hardly match the extent and variety of the forgeries and hypocrisy which have dogged the steps of orthodox faith from the fourth century or before (Christie-Murray 1976:61; McManners 1992:62).

The Europeans arriving in New Zealand brought not only two species of rats but several different forms of Christianity. The dominant forms of the invaders of both kinds, the rats and the religions of the Europeans, successfully out-competed both the weaker forms of their own kind and also their Maori equivalents. But not all invaders are equally successful. House sparrows and starlings inhabit every town in New Zealand, but they seldom disperse to uninhabited islands because they need the advantage of entering an environment prepared for them by human disturbance - clearing bush, building houses and ravaging the natural fauna. Like most unsuccessful invaders, starlings and sparrows tend to falter when faced with an undisturbed environment fully stocked with equivalent native forms. Likewise, part of the reason that Christian missions succeeded in New Zealand from 1814 onwards was because their efforts coincided with the devastation of the Maori tribes by introduced European weapons, alcohol and diseases. After a shaky start (Davidson 1991), the mission stations offered them long-term tangible support and education in farming, medicine and ideas acceptable to the remaining elders. By contrast, missions to strong and intact societies such as China and Japan have been much less successful in competition with the existing native religion.

9.4.5 Adaptation: the long-term accumulative process of change

The doctrine of the Trinity developed over five hundred years of arguments between rival interpretations (ie, variation and competition) and clarification by successive ecumenical councils (adaptation) into a concept that none of the disciples would have recognised. Indeed, in *The First Coming* Thomas Sheehan argues that this process eventually distorted the whole point of Jesus' teaching; he had tried to bring the Jews

a message about the Kingdom of God, but the church turned it into a message about Jesus himself (Sheehan 1988). If true, that certainly is a far more radical form of speciation by descent than the transformation of kakas (one kind of parrot) into keas (another, essentially similar kind: Appendix 2.1.4).

The processes of cultural adaptation in the religious world are dynamic, and are still going on. Revelation, speculation (often wrong), experience and synthesis do for doctrine what mutation and hybridisation do for nature. New forms develop whenever local congregations develop in isolation, and they remain different for as long as they remain isolated. That is why there was such a powerful emphasis on cultural isolation among the Hebrews in exile – which later, on their return to Jerusalem, extended even to the breaking up of existing marriages with foreign wives (Ezra 10:11). Reproductive isolation is seldom so ruthlessly enforced among conspecific animals, but it was that experience which defined the distinguishing characters of Judaism, and completed the last steps towards the evolution of Biblical monotheism (Theissen 1984).

The question arises, however, how the concept of adaptation in religious perception is to be understood. In biology, evolutionary adaptation refers to “progressive increases in the [genetic] fitness of a structure, function or whole organism for life in a particular environment, brought about by natural selection” (Allaby 1977). What is the environment to which religion adapts? From Theissen (1984) we can construct a satisfactory answer: *evolutionary adaptation in religion refers to progressive increases in the cultural fitness of a belief or practice for life in the particular environment of the prevailing social perception of the ultimate reality, God, brought about by personal experience and cultural selection.* In nature, environmental changes are on-going, simply because of the dynamic nature of the earth, so adaptation has to be on-going as well. In religion, we may profess that God is unchanging in theory, but we can reach out to God only through our own changeable social perceptions, so adaptation in religion also has to be on-going. Any history of doctrinal development will confirm the process.

Hybridisation, where it is possible, can have profound effects both in nature and religion. In 1957, 26 African queen bees were accidentally released from a research lab in Brazil. They were intended to improve the honey production of Brazilian bees. (In this, the hybrid bees have been very successful: Brazil has risen from the world's 47th largest honey producer to one of the top ten.) By 1994, the progeny of the

original bees were moving northward at a rate of 200 to 300 miles a year, crossing into the United States in 1990. Africanized bees do not have a more powerful sting than the more docile European honeybees that were taken to the New World in the 17th and 18th centuries; but they are much more aggressive. Africanized bees attack in swarms of up to 80,000 and will chase their targets for up to half a mile. They are very easily disturbed, and records of unprovoked fatal attacks are becoming almost commonplace in the southern US and Mexico. This was one hybridisation event that would have been better avoided.

The evolution of Christianity has also involved extensive hybridisation, between Judaic, Hellenistic and pagan ideas. Some would say that, over time, that this process has changed the character of the original Christian revelation almost as drastically as the African bees changed the character of their Brazilian cousins. For example, although pagan celebrations were taken over by Christian observances, pagan influences have never entirely disappeared. The one celebrating the winter solstice on 25 December was turned into the most important festival in the Christian calendar, but older customs remained, such as those involving the supposed magical powers of mistletoe.

Constantine's adoption of Christianity as the state religion of Rome inevitably precipitated a phase of profound adaptive change, which ultimately achieved success, but only at the price of introducing irreconcilable ambiguities into the Christian message. In the hybrid church the ideas and attitudes of the ordinary people who comprised the early Christian communities were expected to become "spiritual furniture for the interior lives, or at any rate the external observances of, judges, senators and consuls" (Martin 1997:114). Over the longer term the ambiguities were expressed in iconography in which, ironically, themes both of both peace and of power were inter-woven – for example, paintings showing Christ armed with both a sword and a lily – and in the military adventures of medieval Christian kings and popes. The contemporary Church is much more sensitive to the inherent contradictions of its position, as was demonstrated after the Falklands War. To the disgust of the military, political and royal establishment, the Archbishop of Canterbury insisted on toning down the overt triumphalism of the thanksgiving service, and including in it prayers for the enemy wounded and for reconciliation (Martin 1997: 103).

Forms that have been separate for so long that they have become too different to tolerate any hybridisation, and strong enough to resist it, will remain separate even

when they meet (Appendix 2). The development of different, non-competing niches and of reproductive isolation – as in the case of the keas and kakas - is an important component of the speciation process, and tends to increase the diversity of types over time. Christianity and Islam, descended from the same Judaic stock, are now quite definitely mutually exclusive. In the modern church there are some sects that emphasise the evangelical aspects of the gospel message and others that emphasise the sacramental aspects. They do not compete for members because, by and large, they appeal to people of different tastes and convictions.

The first irreparable division of the pool of faith into two “species” of Christianity was the schism between the Greek and Latin churches, which, after a prolonged struggle, took final form in 1054 AD. But these two each remained relatively homogeneous internally for some centuries. Things have changed since the Reformation, as the spawning of innumerable new “species” of belief out of the descendants of the Latin church has matched the explosion of Western culture into the New World and beyond. Each split was the result of a paradigm shift in theological understanding shared by some but not others, which forced the budding off of a separate group whilst the original one remained. So, the Eastern church has continued to the present day, as has the Roman Catholic Church since the Reformation, and the Anglican Church since the departure of the various groups of non-catholic Protestants. The net result is, exactly as in nature, a phylogenetic tree of increasing diversity with time (Küng 1990: 123).

Among the new religious “species”, although only one of very many, is modern creationism (as distinct from Biblical creationism, S. 8.2). It is based on an old idea, Biblical literalism, in modern dress, and it has developed because in nineteenth and twentieth century America the idea of literal interpretation of the Biblical stories about creation and its consequent moral teaching has proved advantageous to those who hold it, for various reasons mostly nothing to do with any real understanding of the origin of life. Moral convictions are certainly much more powerfully argued by those who equate them with personal superiority, and since that is a rare commodity, such people are necessarily deceived (S.6.6.3). To a scientist, creationism is not an *alternative* way of reading the book of nature in competition with natural selection, but one of the *products* of cultural selection working within the history (=cultural development) of the church. I see no difference in principle between the persistence of ancient characters in nature, and the persistence of ancient ideas throughout Christian history.

Part III: An Introduction to Biotheology

To the contemporary equivalents of the ancient councils, modern creationism is a heresy; to a biologist, it is an atavism*. It is one of several throwbacks in contemporary Christian belief and practice - earlier ideas finding re-expression, out of context, in modern times. Some remain rejected as inappropriate by orthodox theology, such as justification by works or seventh-day adventism (both inherited from Judaism: Christie-Murray 1976:20); others have been absorbed into the accepted practice of at least some mainstream churches, such as the veneration of images in the Catholic tradition.

The ancient heretics did have one useful function: they “provoked closer self-definition, so serving the cause of Christian truth, or at least playing a crucial role in the development of its articulation, even though the orthodox would not have cared to admit it” (Young 1991:100). This is equivalent to the biological process of “character displacement”* because it tends to clarify and emphasise the differences between two competing forms, the better to increase their chances of co-existing in the same environment. Orthodox Christians are unlikely ever to be able to exterminate modern creationism, but they need to be able to perceive the differences between modern creationism and Christianity, so that, in the words of Joshua, they can see the alternatives and choose whether or not to say “As for me and my house, we will serve the Lord” (Jos 24:15).

The study of atavisms confirms what we know from other sources about the units of information that have been shuffled about in the evolutionary ancestry of modern animals in response to changes in their environments. They also cast light on a curious feature of Christian history: the persistent feeling that change is wrong, and that “human” additions to the original form of Christianity are invalid. Why should this be so, considering that the cultural environment inhabited by the church over the last 2000 years has changed at least as dramatically as that of the keas riding the growing Southern Alps? Surely, in so dynamic an environment some flexibility and adaptation in doctrine was not only inevitable, but positively desirable.

The difference between keas and Christians is that keas do not remember their ancestral form or make value judgements about progressive changes in it. Christians down the ages have always had the scriptures to remind them of the ancestral form of their faith, and they *do* make value judgements about changes in it. Throughout Christian history there have been repeated attempts to return to the original “primitive” Christianity. The establishment sometimes labelled these as heresies, and heretical sects were exterminated. But the ideas behind these “heresies” are far more

9: Links and Parallels

permanent than the sects themselves, and often reappear in a new guise. Some old ideas are no longer useful, and like freak animals are swiftly eliminated whenever they reappear; others have been absorbed into different forms, just as in nature some genes of far distant ancestors remain useful in their very different descendants. In *The Dragons of Eden*, Carl Sagan explains the reptilian ancestry of many lower (ie, automatic) functions of the brains of later forms, including keas and people (Sagan 1977). The genes that make the scales that clothe the legs of keas and all other birds are probably much the same as those that did the same for their reptilian forbears.

In the same way that natural selection formed the mammalian middle ear and voice box from the gill arches of far distant ancestral fish (Gould 1993a), and the lungs that allow terrestrial life from air sacs that enabled certain primitive fish to survive temporary droughts and then get back to the water, so when circumstances change, some animals find themselves already equipped to survive in the new conditions. In the era immediately before the Pleistocene ice ages, the ancestors of the modern weasels had evolved long sinuous bodies for hunting rodents in their burrows. As the climate changed, they found themselves already suited for sheltering from the piercing cold of the glacial climates under the insulating blanket of snow (King 1989). There are parallels in human history; cultural selection can take any existing habit or idea that is vaguely helpful, and by the processes of adaptation can favour modifications that will fine-tune it for a new use in a changing cultural environment. An obvious Christian example is that of the creeds, which began as simple statements of faith, but over time were converted into theologically complicated tests of orthodoxy (Christie-Murray 1976:84).

The most significant example of this process is the long transformation of the story of the Passover, via Temple ceremonial and eventually into the Eucharist. The original event involved the actual killing of many real animals, so that the angel of death could identify and pass over the Hebrew houses by the blood of a lamb smeared on the two door posts and the lintel (Ex 12:22-23). The people were not personally involved except as part of the large-scale supporting cast in the drama of competition between Moses and Pharaoh. Their personal virtues or otherwise were irrelevant, and they did not even know of the divine mercy that was to pass over them, never mind do anything to deserve it. God's grace was truly free that night. The Passover ritual that was developed from that one event focussed on remembering and re-enacting it, causing the actual deaths of millions upon millions of animals over the years until 70 CE.

By contrast, the fully-developed Eucharistic ritual remembers, although not to the extent of re-enacting, the death of *one* person, Jesus the Christ, and the people *are* personally involved. In theory the Church still acknowledges that believers can do nothing to deserve divine mercy, but that did not stop certain sectors of the church at some periods of history from claiming the power to demand visible repentance before dispensing it. People willing to admit their need of grace might then be persuaded to support church institutions (Pagels 1988: 145). God's grace is still free, but perhaps more so outside some churches than inside. Such an interpretation is not merely cynical – it is predictable from biotheology. Powerful institutions can be relied upon to favour the memes that put them at an advantage in cultural selection, however distasteful - just watch the overt playing upon cultural prejudices that assault the voters during party political campaigning before any general election.

In the words of Lohse (1985:xi): “In the dogmas of the church we have been given a heritage that must not be neglected and should not be merely conserved”. Conservation implies taking positive action to retain existing variety and ensure the future survival of all its component parts; but not all species of wildlife, or of ideas, are of equal conservation value. Some, like the ancient endemic birds of New Zealand that give us a link with a now-vanished world, are worth almost anything to save, while others such as possums and rats are damaging invaders that should be controlled in the public interest. Defining “damage to the public interest” is a problem well known to secular conservation biologists (S7), and, in only slightly different form, to the leaders of established churches fighting against various forms of heresy.

9.4.6 Conflicts of interest within and between religious groups

Secular leaders of all faiths or none agree that humanity is in desperate danger if the interests of the individual cannot be not curbed in favour of the interests of the wider society. Yet even within closed groups of like-minded people, the conflict between individual and group interest continues just as in our animal ancestors, only slightly abated by agreed common aims.

There are plenty of examples throughout Christian history, of which those arising in, for example, the recent history of Protestantism in America are better documented than their ancient equivalents but much the same in principle. For example, compulsory celibacy has been highly valued by the members of various groups, from

the Essenes to the nineteenth-century Rappites (Christie-Murray 1976:201), but it usually helps to accelerate their extinction. Conversely, members of groups that value the virtues of willing co-operation, self-discipline, hard work, honesty and frugality have fared much better. In all ages from the apostolic first-century communities in Jerusalem to the Amish in twentieth-century USA there have been people willing to submerge their personal interests in the cause of maintaining group beliefs and identity, and caring for each other in the face of prolonged persecution. Among the many social benefits of Christianity from apostolic times until the invention of the welfare state was the provision of social stability and care for the poor and sick that every-one else ignored.

The question remains, why does our inner nature not predispose us to develop what we think of as the higher characters of civilised human life regardless of circumstances - such as voluntary discipline of our natural desires, or self-sacrifice for the wider community? Biology answers: because such decisions depend on the balance between natural and cultural selection, mediated by personal perceptions of what the other members of the community are doing, especially those that are related to us (S.6.6). Unconditional altruism is a human ideal, extraordinarily difficult to reach in practice. Our inner nature is to be what de Waal calls "adaptive decision-makers", and decisions involving self-sacrifice - personal or genetic - meet powerful scrutiny from our evolved survival mechanisms.

Moral reasoning is done by us, not by natural selection. But at the same time human morality cannot be infinitely flexible. Natural tendencies may not amount to moral imperatives, but they do figure in our decision-making (de Waal 1996:39).

That explains the appalling human impact of the story of Abraham's willingness to sacrifice Isaac. It depends on far more than the emotional horror of knifing a child; Abraham was risking his "seed", his genetic posterity, his only passport to the future.

Abraham's story illustrates starkly the conflict between natural and cultural selection. Augustine recognised the same syndrome, and linked it to the story of the Fall. That link is now not only no longer helpful, but a positive albatross for the modern church: yet the principle is as vitally true now as ever (Campbell 1975). All major religions recognise that the evil that we do in part precedes us (Bowker 1995:112); we do not choose our genes or our environment, yet to a large extent they create what we are,

how we live and how we are likely to die³⁷. All down the ages the idea of some sort of predisposition to sin and death has been the single largest stumbling block to widespread acceptance of the Christian gospel, because people do not like to be told they are rotten at heart. As CS Lewis pointed out, it is very difficult to sell Christianity as the cure for diseased, “fallen” human nature if few people are convinced that they are sick. That problem is even worse now, in the “do your own thing” generation, than it was in Lewis’ time. People prefer the humanist position - that human nature is capable of indefinite self-improvement, and does not need redemption – an idea which Midgley (1985) labels “the escalator fallacy” (S.7.9.7).

In the shadow of Auschwitz, a more sober assessment of the idea of self-improving human nature is possible. Science as well as philosophy and history confirm in different words the traditional starting point of Christian apologetics: we need redemption from our own natures – that is, from *all* forms of selection. Even within the Church, various forms of selection ensure that competition and self-interest are alive and well just as they are everywhere else. For example, in the past both the more authoritarian and the more evangelical branches of the western church have systematically abused the Eden myths for political reasons. In pursuit of ever-expanding corporate influence, they have emphasised original sin rather than present grace. At least at some times and places, ecclesiastical authorities have misused the concept of penance to increase their own power and influence at the expense of freely sharing the love and accepting grace of God. We can understand much about church history, from the earliest struggles between rival heresies through the sale of indulgences to the average vestry meeting, in terms of cultural selection of the strategies most favouring social acceptance and power. The competition between people with different ideas is conducted on much the same terms as competition for survival in the natural world.

9.4.7 Altruism

The concept of kin selection is a recent one, but human societies have long understood it under various other names. Virtually all cultures acknowledge the

³⁷ Hence the widespread conviction that destiny is inborn, a belief that began long before genetics could confirm that two of every three people die for reasons connected with what they have inherited (Jones 1996).

9: Links and Parallels

obligations and benefits of kinship, for example in the saying “blood is thicker than water” (Appendix Table 2). Hence the Levitical law that

If anyone of your kin falls into difficulty and becomes dependent on you, you shall support them; they shall live with you (Lev 25:35).

The same idea lies behind the saying recorded in Proverbs 17:17: “Kinsfolk are born to share adversity”. The Mosaic law that provided for the genetic inheritance of a deceased older brother by the perpetuation of his name (his person was believed to live on in his name, carried by his son) was good animal sense:

When brothers reside together, and one of them dies and has no son, the wife of the deceased shall not be married outside the family to a stranger. Her husband's brother shall go in to her, taking her in marriage, and performing the duty of a husband's brother to her, and the firstborn whom she bears shall succeed to the name of the deceased brother, so that his name may not be blotted out of Israel (Deut 25:5-6).

Since the brothers have 50% of their genes in common, the firstborn of such a union would indeed carry some of the dead man's otherwise lost inheritance (Appendix 2.3.2). The same applies in the world of ideas: martyrs do not give up their own lives for nothing, since their names and principles live on in others, often more strongly than if they had stayed quiet. Centuries of persecutors have discovered indeed that “the blood of the martyrs is the seed of the church”.

Conversely, in a society held together by the mutual bonds of kinship, it was an especially bitter blow for a Hebrew to lose the support of relatives. Banishment from home was a severe punishment:

He [Cain] shall be a wild ass of a man, with his hand against everyone, and everyone's hand against him; and he shall live at odds with all his kin (Gen 16:12).

The prophets furiously denounced rack-rent landlords who forced tenants of their own tribe into slavery by extortionate practices such as usury:

I [Nehemiah] said to them, “We have bought back our Jewish kindred who had been sold to other nations; but now you are selling your own kin, who

must then be bought back by us!" They were silent, and could not find a word to say (Neh 5:8).

Most cutting of all was unbelief:

Jesus said to them, "Prophets are not without honour, except in their hometown, and among their own kin, and in their own house" (Mark 6:4).

The classic scriptural example of kin selection is the case of Solomon's judgement over the two women and the baby. The woman who was the real mother was bound to be the one most concerned for the child's life (and thereby, though not consciously, for her own genes). The other woman was motivated by feelings within herself, which were no doubt very strong but did not include any genetic imperatives. Every mother knows her own offspring, so the one that had deliberately stolen the child did at least know that it was not hers. On the contrary, although she was desperate to gain possession of the child, and thereby the social status conferred by motherhood in that society, she would sooner see the child dead than let that advantage go to her rival. Solomon's proposal to kill the child was inspired precisely because it was the only action which could have brought into the open the genuine, genetically-based willingness of the real mother ("her heart yearned for her son": 1 Ki 3:26) to trade her maternal rights for the child's life ("give her the living child, and by no means slay it"). Nothing in the other woman's agenda could match that, and so, at the critical moment, she gave herself away by revealing her very different priorities ("it shall be neither mine nor yours; divide it").

In *The Making of the Creeds*, Frances Young makes the point that "The crucial Arian debate, and the subsequent debates [of later centuries]...constantly pre-suppose the emotional investment of people who saw their salvation threatened by the ideas they opposed" (Young 1991:49). The bitter conflicts, even between relatives, that have peppered the collective development of church doctrine were always over what each saw to be non-negotiable items of belief affecting their own future. They have an exact parallel with the conflicts within animal families over the non-negotiable items that affect their futures - the resources that ensure survival. Young's quotation can be paraphrased in Darwinian terms and applied to human nature as follows: "Conflicts between cultural groups constantly presuppose the cultural investment of individuals who see their social success threatened by the individuals they oppose".

Within the Christian community, the age-old internal divisions and arguments over heresy have now given way to the ecumenical movement. As David Christie-Murray puts it, “the challenge by secularism to Christianity [has] emphasised the need for co-operation rather than strife between the denominations” (Christie-Murray 1976:216). At one level this can be interpreted as an outpouring of the Holy Spirit through the charismatic movement. So the modern age has seen unprecedented increases in co-operation between rival sects and a radical minimisation of arguments over what constitutes a heresy. But a biologist would point out that an equally plausible (and not necessarily mutually exclusive) explanation is provided by game theory. Both animals and Christians are equally capable of forming either friendly alliances or deadly rivalry, according to circumstances. The Christian denominations have discovered that, in the environment of the twentieth century, they can advance their own agendas more effectively by co-operating with each other than by continuing the no-holds-barred competition of, say, the sixteenth century. Indeed, the fine balance between cultural and genetic fitness controlling both options now extends even to co-operation between totally different religious traditions, if the stakes are high enough.

At the United Nations Conference on Population and Development in Cairo, representatives of secular governments, including the Vatican, proclaimed in their different ways the urgent need to find some way to steer the future course of human evolution. The Vatican and fundamentalist Islam have been long-term antagonists, at least until Vatican II, but at that meeting they found unexpected common ground in their determined opposition (for radically different reasons, theological rather than practical) to any suggestion of legalisation of abortion. Observers familiar with game theory were probably better able than most to understand what looked like extraordinarily cynical political manoeuvring on the part of the papal state. It would be a pity if world reaction to the Romans’ tactics at that meeting masked the truth of other aspects of the Christian message, especially in its less controversial forms.

9.4.8 Contingency and direction : is history progressive?

The history of life has generally proceeded from the simple to the complex, from the first few basic molecules in the primordial soup to the staggering variety and diversity of life crowding every conceivable habitat on earth today (Wilson 1992b, and see Appendix 2). It is common to interpret this general pattern as an inevitable upward

march towards the crown of creation, *Homo sapiens*. Indeed, that is a required assumption for Christians who want to substitute evolution for special creation as God's route to the incarnation - including, most notably, Pierre Teilhard de Chardin. Others, eg Burhoe (1970) go further and substitute evolution for God, seeing the whole process as a passport for escape from the degrading animal company that contaminates the human past, a guarantee of a glorious, rational future. Critical responses to this idea, known as "the escalator fallacy" are decisive (Midgley 1978:197, 1985:67).

There is no evidence of steady improvements of types, or that evolution is progressive, in either the natural or the human worlds. If it were, we should be able to detect a smooth, or at least unidirectional, development of forms or ideas from a simple beginning to a complex later state; the present should be predictable from the past. The earliest known fossil assemblages should contain fewer types than later assemblages. But that is simply not the case. One of the earliest known assemblages, well preserved in the Burgess Shale, in the Canadian Rocky Mountains (Gould 1989), records a community of marine animals that lived together some 530 million years ago. They mark the explosive diversification of multicellular life that was made possible by the evolution of sexual reproduction. Meiotic sex* hugely accelerated the shuffling and recombination of genes, which in turn vastly accelerated the generation of the diversity on which natural selection could work and at the same time made possible a sophisticated self-checking mechanism. The consequence was the first arrival of Cambrian fossils into the geological record - although that was not the reason that meiotic sex first evolved (Maynard Smith and Szathmary 1995:8).

Most of the creatures in the Burgess community bore no relationship to any living forms, and cannot be fitted into any existing system of classification. Moreover, they came in an astonishing range of different designs, suggesting that, against all expectations, the sweep of anatomical variety reached its maximum soon after the first diversification of multi-cellular animals, and the later history of life has proceeded by *elimination*, not expansion. Modern seas certainly do contain many more *species* than those of Burgess times, but most are variations upon a few basic *designs*. Indeed, *all* the familiar "higher animals" of the modern world, the fish, amphibia, reptiles, birds and mammals, are the product of endless variations on only *one* single design, that of the vertebrates.

The many Burgess animals of different body forms that failed to leave descendants were apparently well enough adapted for the conditions of their time, but were still eliminated. There are two conflicting interpretations of the Burgess story. By far the better known is that of SJ Gould, which is that the extinctions were unpredictable and that, if the tape could be wound back and the game of life recorded again, a different selection of forms would be successful. For Gould there is no guarantee that a re-run of the history of nature would produce a world anything like ours, let alone human life as the crown of it. He finds nothing in contemporary science to support Tielhard's vision of continually increasing complexity and directed ascent to the Omega Point. The Burgess extinctions were due, not to bad genes but to bad luck.

A very different view is held by Simon Conway-Morris (1998), based on the widespread observation of convergence of body form among animals of different ancestry living in similar habitats. He points out that nature has already performed several "run the tape again" experiments. In the isolated continents of South America and Australia, animals of cat-like, wolf-like, even sabre-tooth-tiger-like habits evolved quite independently, adapted to a similar ecological niche (though often different in detailed appearance) to their equivalents among the placental forms. The implication is that, since the selective advantage of manipulative intelligence among sociable animals is so great, if humans had not arisen from among the vertebrates, sociable creatures with advanced mental capacities would have emerged from some other stock. He therefore seems to lean more towards the idea of progress than does Gould. As one reviewer, making the inevitable comparison between the two authors, pointed out: it is impossible to study evolution without taking a larger view of truth. It seems likely that this particular pair of apparently conflicting views could be influenced by the fact that Gould is a Marxist and Conway-Morris a Christian.

It is true that a Tielhardian interpretation of life's history could be constructed from the statement of Maynard Smith and Szathmary (1995:6) that, through every major transition in evolution, "entities that were capable of independent replication before the transition [could] replicate only as part of a larger whole after it"- implying progress in co-operation, a distinctly Christian idea. But that would be to ignore the same authors' point that biology cannot support any interpretation of progress, because progress cannot be defined in biological terms. A simple increase in complexity is no good, since in countless species, such as most parasites, progress is defined by simplification. Neither the genome size nor the mathematical measure of fitness can be used as substitute measures of progress either.

Yet is there any reason to expect any such correlation? Christian history might be the one place where one ought to be able to find evidence to support the idea of progressive improvement with time in our understanding of the various forms of truth, but if there is any such evidence, it is hard to spot. The history of Christian attitudes to women offers an intriguing cultural parallel to Gould's interpretation of the story of the Burgess Shale.

Pagels (1988) describes how the early church celebrated a doctrine of universal acceptance of humanity by God and an ideology of moral freedom, especially of women. Clement of Alexandria (c 180CE) regarded sexuality in marriage as a conscious co-operation with God in the work of creation³⁸ – which is, along with the idea of sex as crucial to pair-bonding, a surprisingly modern concept. Clement also extended the statement in Genesis that God had created all humanity in his own image as evidence of the equality and infinite value of every individual human life, each one entrusted with free will and moral responsibility. For almost 400 years, Christians regarded various forms of freedom as the primary message of Genesis 1-3 - freedom of will, freedom from demonic powers, from social and sexual obligations and from tyrannical secular government. The threat of persecution proved insufficient to counter the attraction of the message of freedom for thousands of converts.

Yet over a short period in the fourth century this intoxicating freedom was suddenly converted into a doctrine that emphasised universal *bondage*. The work of Augustine, conducted in a totally new post-Constantinian environment that regarded freedom with suspicion (in case it might prove to be an enemy of the emperor) was based on a different interpretation of Genesis, that Adam's sin corrupted all hope of moral freedom, and indeed made us incapable of genuine freedom or moral responsibility of any sort. Augustine effectively eliminated all belief in freedom from the early church, and ensured that it was replaced by the more politically expedient idea that humans *need* external government. He also added some bizarre interpretations of sexuality, and the blank denial of mortality and sexual desire as natural at all. Against the opposition of Irenaeus, Justin, Tertullian and Clement, Augustine reduced the early variety of Christian ideas about freedom to the single and very different idea of universal corruption - especially of women (ibid:73, 97). At least with respect to this key central doctrine, there has been no cumulative increase in variety as scholars learned more, but rather a "collapse into simplicity" (McManners 1992:84).

³⁸ Clement, *Paidagogos* 2,83, quoted by Pagels (1988:27).

Eventually Augustine persuaded many bishops and several Christian emperors to drive out of the churches as heretics those who held on to the earlier traditions of Christian freedom. From the fifth century on, his pessimistic views of sex, politics and human nature became the dominant influence on western culture, replacing all early variety as surely as the vertebrates replaced the Burgess fauna. Neither development could have been predicted in advance: both illustrate the general rule that the processes of adaptation are contingent and chancy, not a grand march to Omega.

Could we be sure that if the tape of Christian history were run again, the same doctrines would have emerged as successful? It seems unlikely, since so much depends on the individual protagonists, the circumstances of the conflict, and chance events that influenced the judgements of the participants and the listeners. Convergence of religious doctrines under cultural selection is not at all the same thing as convergence of body forms under natural selection given the physical constraints of the material world, so my guess is that Gould is right, the particular run of history we have experienced was unique.

9.4.9 Conclusions

The long rearguard action by the nineteenth century church against the theory of evolution and all its implications is described by Mary Midgley as a

bizarre tactical aberration...the church exhausted, distorted and discredited itself in order to combat a quite imaginary danger. Most Christians today readily accept that the earth does not have to be in the centre of the universe, and that God, if he could create life at all, could do it just as well through evolution as by instant fiat (Midgley 1978:xix).

This is a common compromise view much favoured by those keen to find an easy middle ground between science and theology, but it contains an unexpected hurdle. The same people who are so ready to assert that God works through evolution also believe, with equal fervour, that creation is good. Yet the concept of God using evolutionary processes *directly* to create parasitic worms and hyenas introduces contradictions with other things that clearly have to be believed by Christians, such as that *God* is good. The compromise formula leaves the most vital question unanswered, concerning not how, but *what* has been created.

The key to the dilemma is the vital distinction between *evolutionary egoism*, the unconscious “selfishness” of the “selfish genes” of Dawkins’ famous but misleading metaphor, and *vernacular egoism*, the personal selfishness exhibited by a conscious individual (Wilson 1992a). The gene-centred approach to explaining the workings of natural selection has been hugely successful in biology, and, with certain caveats, the idea of memes as equivalent units of information that are acted upon in comparable ways during cultural evolution can be helpful to understanding of human history. People are both part of nature and also apart from nature, and the difference hinges to some extent on the way that our evolutionary background biases our personal choices. This is the same distinction, put in different words, that the church has always made between original and personal sin.

Tielhard believed that evolution in nature is a directed process, but mainstream science declares that it is a *consequence* of the choices constantly made by natural (and eventually also cultural) selection between individuals of different genetic makeup interacting in different conditions. Each choice leads to the next choice, and few steps are predictable from further back than the previous step. The truth might lie somewhere between these two apparently conflicting interpretations.. The same Darwinian processes of variation, competition and differential survival among heritable units of information are at work both in nature and in the church; multi-level selection can explain a great deal of what we see in both, right up to the ultimate, conscious rejection of selection as the organising principle of moral life. Gerd Thiessen’s magnificent book *Biblical Faith: an Evolutionary Approach* (1984) illustrates the process in theological terms, from the slow emergence of monotheism to the contemporary action of the Holy Spirit. He does not discuss either genes or memes as units of information, and he stretches certain biological terms (his use of “mutation” seems to mean “recombination”), so his use of evolutionary concepts is not at all technical, but that does not undermine his totally compelling case for interpreting the history of Biblical theology in evolutionary terms.

I have added to Thiessens’ general framework by making biotheological comments on various aspects of Christian history and human relationships. Biotheology supports many basic Biblical insights, and helps explain why so many Christians have rejected the idea of evolution, in Darwin’s time and ever since. It exposes the deep evolutionary roots of our nature, which influence our decisions and attitudes in ways that we would rather not recognise. The appropriate response from us is not denial, but acceptance of the depths and variations of self-interest in us all, even to the extent of unsuspected self-deception, and our need of grace throughout history.

Christians at their best have always recognised in theory the absolute dependence of all life on the grace of God; Darwin's unique contribution was to lay the foundations of the contemporary studies that are now bringing out the stark details of just what that grace has to overcome.

The relevance of this conclusion for the Fifth Mission Statement is simple. When we ask people to defer or abandon private advantage for the sake of global benefits that would be shared by non-relatives and competitors, we are asking for behaviours that have no evolutionary precedent (Heinen and Low 1992:107). Such exhortations cannot be relied upon to work on a sufficient scale, because the adaptive responses that strongly influence human choices are necessarily a product of past environments, particularly our past history as members of small groups co-operating with each other but hostile to other groups. The environmental crisis, by contrast, is a completely new and unique situation, demanding an unprecedented degree of thinking in terms of the interests of the global community, a task for which our mental equipment is simply not geared. Even the concept of a modern nation-state is too large a unit for comfort, since interest-groups within nations can easily affect the chances of ratification of international treaties (ibid: 114). Some of the implications of this conclusion for the practicalities of environmental management implied by the Fifth Mission Statement have been examined in Part II (S.4-7).

10 THEOLOGY AND THE ENVIRONMENTAL DEBATE

The process of public promotion of the Fifth Mission Statement will inevitably invite inspection of the Church's ideas about creation, so it would be as well to check on our contemporary understanding of it first. Like all religious models, the doctrine of creation is neither a literal description nor a useful fiction, but a human construct that allows us to interpret our experience by imagining what cannot be observed (Barbour 1997: 119). The critical realist approach (S.1.6) requires us to take this and all theological models seriously but not literally; not as a static entity, but as a continually adjustable, fruitful source of improved understanding of pre-existent reality. How much progress has the Church made in this challenging but necessary process?

If there ever was a time when it was possible to think about theological questions with the calm civility associated with venerable institutions and ageless traditions, that time is now long gone. The challenge of various new paradigms, especially feminism, to all forms of academic work has already shaken the ancient traditions. Now the additional, even more urgent environmental crisis that faces all humanity has simply removed the easy option of regarding the future as a predictable extrapolation of the past. It is too late to study systematic theology hundreds of years in the making (as taught in traditional theological colleges) and ask what it can say about the contemporary problems that did not exist, or were not recognised, until twenty or thirty years ago: now we are being forced to look at contemporary problems and ask what they mean for the reform of systematic theology.

That reform is beginning, and, so far as it goes, it is immensely exciting - the Bibliography cited here gives a flavour of it - but it is achingly slow. Debate in theological colleges on the feminist critique of ancient doctrines is much more intense than on the environment crisis. Theologians should be working hard to inform policy-makers and public of the spiritual and social consequences of current demographic and ecological forecasts, but, like the scientists criticised by Ehrlich (1997), too many devote themselves to ever-more sophisticated analyses of trivial questions. At parish level, environmental matters are usually regarded as a side issue, and get rather little attention in comparison with the much-higher profile arguments surrounding internal church politics.

10.1 Current developments in creation theology

In the contemporary world, global conservation is a multi-cultural issue. A Christian theology that is to avoid sabotaging dialogue with people of other faiths or none must shift into a new gear, since "there can be no responsible theology now that is not global in its perspective", says Hall (1986:41). On the other hand, the convictions that motivate any particular party to the debate are their own, and the better understood they are, the more likely that party's contribution is to be convincing and helpful. It is therefore vital for Christians involved in the debate to appreciate the unique perspective brought by Christian theology to the problems of global conservation.

All credible theologies must take into account the view of reality current in their own day (McFague 1993: 73-4, Peacocke 1993: 7). Over the long history of Christianity, that has meant periodic reformulations of doctrine: so Augustine integrated Christian concepts with the world view of neo-Platonism, Aquinas with that of Aristotle, and Paley with that of Newton (Kaiser 1991). In any age, when the secular picture of reality undergoes a significant paradigm shift, theology must attend to it, despite its general suspicion of innovations (Küng 1989). It may take a while: the Roman Catholic Church reinstated Galileo only in 1992, and recognised the Darwinian theory of evolution as valid four years later (John Paul II 1996).

The challenge has already been taken up by, for example, the feminist and process theologies of today. Not everyone will agree with their positions, but they have helped the Church recognise that science and theology *both* depend on mental constructions and metaphors to create models of invisible reality that are *in principle* open to correction, and that is making possible a new phase of serious discussion between scientists and theologians³⁹ The introduction of Darwinian perspectives into traditional creation theology may well be resisted in some quarters, more so at parish level than in theological colleges, but it does not require nearly so drastic a revision of old ideas

³⁹ Not all members of either camp are included, of course: but fundamentalist Christians on the one hand, and hard-line reductionist scientists on the other hand, represent the two ends of a broad spectrum of views that includes very many open-minded enquirers not committed to either extreme.

as has feminism, which has already demanded reinterpretation of the Eden story for reasons of its own (Pagels 1988). Some authors call for a restructuring of the entire framework of Christian thought about the relationships between God and the world (Gosling 1992:49); others maintain that the only change required is a more faithful understanding and preaching of established doctrines (Berry 1995: 40). The most recent, thorough and authoritative treatment opts for “starting all over again” (McGrath 1998), because

what once seemed as if it might be a wonderfully creative and interesting discussion appears to have degenerated into little more than a slanging match between a group of natural scientists bent on eliminating religion from cultural and academic life, and a group of religious people who seem to know (and care) nothing for the natural sciences. What the Renaissance envisaged as a dialogue has degenerated into what is depressingly often a mutual display of ignorance, hostility and spite (p.7).

The World Council of Churches is at the forefront of the effort to redefine the relationship between humanity and creation. A recent summary of its activities (Chial 1996) placed the “need to re-articulate theology of creation” as central to this concern. However, Chial laments that no coherent new formulation has yet emerged, nothing that inspires change; the prevailing version

remains bound to western industrial and economic models that seek to manage and control...the ecumenical movement has barely begun to...provide an ethical approach to the tensions between ecological concerns and social needs. Nor have churches in the North had much impact in the area of curbing the consumerist life-styles that remain at the heart of their governments' opposition to global environmental and economic agreements (pp.53-4).

In my view, no ecumenical reformulation will make much headway until it takes seriously what biology can say about the influences of game theory and of the unconscious roots of human morality on individual ethical decisions (S.7.2).

As summarised in S.8.2, the Christian theology of creation asserts that the world is:

intelligible, because its fundamental laws were set by a supremely rational creator;

reliable, because the faithfulness of God stands behind it and continually upholds it; *sanctified*, by the continual presence of God in it, and by the incarnation in historic time;

indispensable, because it is our meeting place with God in contemporary time;

sacramental, because it is the outward and visible sign of God's love and energy; and

significant, because the freedom of all creatures in the present is real, and their use of it determines what will be available for God to take up into the new creation at the end of time⁴⁰

These beliefs help to develop very positive attitudes to life in general and to environmental matters in particular. People who share them will feel confident and "at home in the universe", recognising but able to face the modern and psychologically devastating uncertainties projected by extreme doom-sayers and nihilists. They will think of all creation as in some sense sacred, so will be unlikely to abuse it or treat it as having merely instrumental value, and will not give up on caring for it or on opposing the forces of destruction. The world makes ultimate sense to them, despite its many and very real agonies, because it is not a self-contained or meaningless system but has behind it the purposes and the faithfulness of God.

The literature describing modern developments in creation theology is recent but huge (much of it is well summarised by Peacocke 1993 and Barbour, 1997). It includes extensive, sympathetic but critical re-examination and updating of the formulations of ancient wisdom in the light of the Darwinian understanding of nature. This immense task is now being actively pursued by contemporary theologians of most Christian denominations as the evolutionary and physical sciences progress (eg Hefner 1993, Page 1996, Peacocke 1993, Ward 1996; McGrath, 1998). Their work encourages me to believe that *provided* the Church begins actively to teach the Biblical doctrine of the integrity of creation in its authentic form, and to correct the centuries of misinterpretation denying the compatibility of Christian creation theology with science, it has the potential to provide the macrophase* wisdom that our society so urgently needs. On the other hand, we cannot assume that merely providing that information will be enough. Forty years ago, Teilhard de Chardin proposed extensive doctrinal reformulations in the light of the evolutionary biology of his time, but with rather little impact upon mainstream theology.

⁴⁰ This concept was mentioned in a lecture by John Polkinghorne at the Templeton Workshop in Oxford, July 1996, but I have not found it in print.

Our models of the general characteristics of nature will affect our understanding of God's relationship to nature, and hence our interpretation of creation and redemption - the enduring themes of Christianity.

Nature today is understood to be a dynamic evolutionary process with a long history of emergent novelty, characterised throughout by chance and law. The natural order is ecological, interdependent and multileveled. These characteristics will modify our representation of the relation of both God and humanity to non-human nature. This will, in turn, affect our attitudes to nature and will have practical implications for environmental ethics. The problem of evil will also be viewed differently in an evolutionary rather than a static world (Barbour 1997:101).

A Church speaking to informed audiences can no longer hold as rational any concept of creation that involves a precise, hands-on, active moulding of living creatures by God. Jeremiah's prophetic image of the potter (Jer. 18:1-12) shaping and reshaping a vessel is commonly misinterpreted by fundamentalists as a picture of God working on Creation. Matter is seen as totally inert, shaped only by the hands of the potter, owing nothing to any random process and incapable of any initiative of its own. In fact, Jeremiah's point was a totally different one, calling the House of Israel to repentance in order to escape impending disaster, just as a spoiled pot can be replaced by a good one⁴¹. Theological doctrines always start as human reflections, so Jeremiah's interpretation of the Old Testament view of God's relationship to creation, still accepted by literalists, conditioned his view of the potter. Equally, Darwin's interpretation of ruthless nineteenth-century industrial competition probably conditioned his theory of natural selection (Grant 1993).

The current view is that living beings are neither inert nor the product of solely random processes. Rather, it is the *interaction of chance and law in an orderly universe* which provides the crucial conditions for natural selection to operate (Appendix 2). Peacocke (1979:95) describes chance as "the search radar of God", sweeping through all potential fields of statistical possibility. Without chance there could be no new variations; without order, all new variations would be immediately lost. Favourable variations are accumulated over many generations, and evolution - changes in gene frequencies from one generation to the next - is the result (Appendix 2). It is the *consequences* of natural selection that produce new life forms.

⁴¹ New Oxford Annotated Bible, p. 936

Models of natural selection based on population genetics concentrate on the codical domain, but theology is concerned with the material domain, the scene of all our lives, experiences and morally significant decisions. In my view, theology need have no qualms about accepting the concept of cumulative change by natural selection. It is not, as Williams (1996:156) asserts, an “evil...unreasoning enemy⁴²”, but a statistical, often very small, difference in the probability of reproductive success between slightly different individuals. The real freedom that God has given to all life places no limits on the actions of natural selection in the natural world; nor, presumably, on the multi-level processes which led to the emergence of cultural selection in the human world, and eventually to the abandonment of selection in the spiritual world (Fig 3). Moreover, God accepts the consequences of creaturely freedom, and loves the resulting riotous variety of amoral natural life presumably as much as God loves the variety of moral and immoral human life that evolved from it. God created, not individual organisms, but the fundamental laws by which, first the universe itself, and then living organisms within it, could create themselves.

This is not such a modern idea as it sounds: it was already foreshadowed in the historic creationist tradition (S.8.2). Augustine himself clearly recognised that the creation brought into being by God was gifted from the outset with the capacity to assume a rich diversity of forms (van Till 1996). Although Augustine was not prepared by his intellectual heritage or environment to consider the idea of evolution as we now understand it, his picture of a creation gifted with self-actualising potentiality is certainly not incompatible with Darwinism. Indeed, I venture to guess that Augustine would have been appalled by the modern “scientific creationists”. Like all his contemporaries he understood Genesis 1-3 literally, but he also insisted that

the literal meaning ...may never stand in contradiction to one's competently derived knowledge about the earth, the heavens and the other elements of this world...[that are] certain from reason and experience...Augustine soundly reprimands those Christians who defend interpretations of Scripture that any scientifically knowledgeable non-Christian would recognise as nonsense (van Till 1996:30).

Page (1996) has put that ancient insight into the context of evolution, arguing that what God created was *possibility*, without strings or conditions of any sort - she does

⁴² Darwin himself called natural selection “clumsy, wasteful, blundering, low and horribly cruel” (quoted by Rolston III 1994).

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not even allow that God might have nudged evolution along in a preferred direction, such as that leading to humans - and the world we see is the response of living things to the possibilities opened to them. God's action in the world is defined as 'a continuous giving room to explore what is possible' (ibid:17), not a direct action of making any particular thing.....So 'the sense of wonder remains, but is redirected from a 'something' to the whole changing variety of what has been and now is in the world' (ibid, p.4). Chance is part of the design, not incompatible with it. The freedom it provides makes love possible, she says, and is the indispensable prelude to the relationships between God and creation which grew from this freedom. God is passionately involved in those relationships at every level.

The trouble is, freedom produces

human and non-human suffering from the way in which change and variety in creation have unpredictable and unfortunate results...Because God is involved in the relationships, the pain as well as the pleasure is part of the divine experience. Yet it cannot be relieved by God, since that would remove the fundamental freedom to use possibility, which is the gift of creation (Page 1996:105).

On this view, it is merely a logical consequence of creaturely freedom that, when a lot of independent and non-social animals pursue their own self-interest at the same time and place, many forms of evil are the direct result. A modern creation theology that has recovered Irenaeus's ancient perception of creatures as necessarily imperfect (Brown 1975) sees evil as the unavoidable consequence of freedom: God could not have prevented it (Hick 1977). This is the simple and obvious answer to Gould's concerns about the ichneumon wasps (Gould 1983b). The problem of evil, for the biologically-informed theist, is not the existence of evil, such as the apparently useless suffering of the ichneumon's caterpillar victims or of the last-hatched "back-up chicks" of the pelican (McDaniel 1989), but the *extent* of it. Contrariwise, for the reductionist sociobiologists, the most puzzling problem is the existence of genuine goodness (S.6.6).

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The Christian doctrines of incarnation and redemption emphasise the Christian belief that the material creation *matters*⁴³. Evil, or at least, disvalue, may arise from matter (Rolston III 1992), but (in clear distinction from many rival theologies of New Testament times) matter is *not* itself intrinsically evil; the world is our home and is sanctified by the presence of God in it.

The original Hebrew concept of creation did not include the idea that nature was also corrupted by the fall of Adam (Kaiser 1996). That idea, although applied only to arable land and human nature rather than to the whole of wild nature (Kaiser 1996), was added by Augustine, via a train of logic that seems bizarre to us. Modern philosophers agree that, regardless of Augustine, no part of the cosmos needs redemption in the same sense that humanity does. Nature's problem is not the guilt of human sin, but the consequences of it (Rolston III 1994). On the other hand, the cosmos would certainly benefit from human redemption to the extent that redeemed humans learn to care better for creation. Our material life and environment, once shared by the Word of God, are thereby affirmed as worthy and to be cherished; and a cosmos loved enough by God to be thought worth visiting in person deserves our greatest care. Teilhard too argued that sin and evil are both inevitable consequences of the slow creative processes of evolution, which means that creation and redemption are both included in a single process (Barbour 1997:248).

Physicists are in no doubt that at some point in the relatively near future (about 10 million years, according to James Lovelock⁴⁴ - that is, less than a quarter of the time since the extinction of the dinosaurs and the rise of the mammals) - the unstoppable rise in global temperature will extinguish all life. The last survivors are more likely to be thermophilic micro-organisms than complex and vulnerable mammals such as humans. But that does not mean that conservation is pointless: as Leakey (1996: 253) argues, "...the fact that one day *Homo sapiens* will have disappeared from the face of the Earth does not give us licence to do whatever we choose while we are here".

The contemporary process of rethinking of the Church's attitudes to the natural world has to be done in the context of the other experience of and knowledge about the

⁴³ It is an ironic contrast, says Ward (1992: 146) that materialism "takes much too *low* a view of matter".

⁴⁴ In a lecture given at Green College, Oxford, February 1997

world which people have to integrate with their understanding of theological teachings, and that means greater integration of theological and secular expertise. For example, arguing against traditional belief in, say, the Garden of Eden or the Fall is logically necessary in modern culture, but does not destroy the ancient insight that humans are naturally sinful. Adam's sin is no longer needed to explain human failings, since sociobiology explains them better (Williams 1998), but shifting to that explanation requires establishing a link with evolutionary science. That is no problem for a scientist, but it is a real stumbling block for those whose knowledge of biology and earth history is hazy. We need to find ways of doing that in terms that mean something to ordinary people. The thought of involving the laity might be scary to professional theologians, but, as Schmitz-Moormann (1995) points out, tongue firmly in cheek, it should be no more impossible for theology to involve non-theologians than for God to raise sons for Abraham from stones. After all, in so far as theology has access to raw data comparable with those of the sciences, those data consist of the religious experiences of ordinary people (Murphy 1990, Peacocke 1995).

Moreover, theological reforms are less likely to be successful if they do not carry the people with them: as (Cupitt 1984:25) points out

In England...religious change always began with the King and the Court, who then simply imposed the new order on the country...as a result the English have a long tradition of resenting....a religious order imposed upon them from above.

New Zealanders share some of this attitude, as was well demonstrated during the negotiations over the 1971 Plan for Union.

Much of the resistance encountered in applying scientific ideas to human affairs comes from prejudice against science, almost always due to specific misconceptions. An unpublished American survey found that an astonishing 45% of 1200 first-year university students rejected evolutionary science (Zacks 1997). Their objections were not primarily due to religion, but to demonstrably false interpretations of standard theory, such as "mutations are never beneficial to animals"; "the methods used to date fossils and rocks are unreliable"; and "the chance origin of life is a statistical impossibility". Some unknown number of New Zealand students may have similar problems.

Poor science education among congregations is relevant here, because Christians need to understand some basic science if they are to take the Fifth Mission Statement seriously. People who still believe that God set limits to the sea⁴⁵ and made the hills to stand eternally are not well equipped to deal with the problems arising from global warming, rising sea levels and massive soil erosion.

Those who are already well versed in science may have a different set of problems with integrating evolution and religion. Prejudice arising from respect for well-known authorities critical of religion such as Richard Dawkins will certainly make promotion of the Fifth Mission Statement to students difficult, just as Lynn White's critique of Christianity influenced the previous generation of students, including Max Oelschlaeger (1994). The metaphor of the selfish gene is widely known but misleading (S.6.6.2), and feeds the conflict model by seeming to present religion and science as *alternatives*. In fact, the opposite to religion is *materialism*, not science itself (Ward 1996). By contrast, the idea of emergent properties and multi-level selection, which allows for true Christian ethics to evolve from gene-centred processes (S.6.6.5) is not yet widely *enough* known. In either case, it seems that Church-sponsored education programmes in creation theology will have to start with basic evolutionary science. Perhaps the education process should go both ways: as Holmes Rolson (1994) remarks, perhaps theologians need to figure out what they believe before they talk to biologists; perhaps theologians will not be able to figure out what they believe until after they have studied biology.

10.2 Biotheology and the origin of true Christian ethics

In S. 6.6.3 we discussed the idea proposed by Alexander, E.O. Wilson and the reductionist school that emotions such as love, loyalty, sympathy and gratitude are also products of natural selection, along with legs and wings. Their gene-centred view of natural selection has some interesting implications for any updated version of Christian theology. If our emotions are the conscious feelings that lead us to make decisions consistent with the biological processes (kin selection and reciprocity) that favour long-term *genetic* altruism, is *truly disinterested* altruism possible at all? And what part might

⁴⁵ This is not only a matter of education in science but also in theology. To the Biblical writers, the sea represented chaos, which is why, in the book of Revelation's vision of the new earth, "the sea was no more" (Rev 21:1).

God have played in developing these processes, especially if they involve deception? And what are the implications for the great moral dilemmas that the Fifth Mission Statement raises for Northern countries?

The problem is especially acute for practising Christians. We like to think of our religious emotions as noble and above self-interest, but “consciousness cloaks the cold and self-serving logic of the genes in a variety of innocent guises” (Wright 1994: 275). Could that be true?

It certainly is true that almsgiving serves our feelings of self-respect, to the extent that Jesus had to warn his followers to do it quietly (Mat. 6:2); the idea of loving our enemies is surely indistinguishable from revenge if its motive is to “heap coals upon their heads” (Rom.12:20); if it gives us pain or guilt to see people in distress, helping them may be as much in our own interests as in theirs (Mat.18:31); if we serve God only in the hope of attaining heaven, we can hardly claim a disinterested motive (Titus 3:7); and so on. E.O. Wilson’s famous comment about Mother Teresa (pointing out that her remarkable altruism was backed by her certain conviction of a heavenly reward) provoked, predictably, an outraged reaction (Grant 1993: 103), but to be fair, he did have a point.

It certainly is true that many of our moral imperatives can be understood in terms of good strategies in the game of Tit-for-Tat, and are consistent both with street justice and with scripture. For example, retribution (“an eye for an eye”) helped to solve the problem, that faces any moral system, of how to deal with cheats. Sympathy would be counter-productive if it threatened group survival, so on this view, long-term cultural selection has predisposed us to say, if a cheat suffers, so be it, he deserves to. But “an eye for an eye” was a social advance in its time, because it forbade the offended party to take “exemplary vengeance”, i.e. worth more than the damage done. Over evolutionary time, cultural selection favouring this restrained form of retaliation conferred an advantage on the individuals and groups who adopted it, and thereby preserved the workings of reciprocal altruism without excessive social costs. Further, the extension of this score-keeping process to retributive justice in the next world may often be the only consolation for the continued injustice in the present one.

When Jesus taught that we should love our enemies, he was suggesting that we should go several steps further than cultural selection, into the realm of no selection (Fig 3). He denied that the Biblical eye-for-eye retribution was a command of God, thereby removing its old authority. Instead, his teaching pointed towards a set of higher ethical truths that long anticipated the conclusions of Axelrod’s computer

analyses of repeated games of Prisoner's Dilemma (S.6.5) They include: forgiveness, especially in marriage, is a good investment; it pays to help others but also to stand up for oneself; love thy neighbour is simply good diplomacy. Forgiveness of insults and free acceptance of cheats is not only a way of obeying Dawkins' injunction and demonstrating that we are not slaves to our selfish genes after all, but also encourages greater compassion and concern for our fellow human beings, as Jesus taught (Wright 1994:338).

So in my view there is no question that evolutionary processes must be accepted as part of any contemporary theory of morality, including the counter-intuitive insight into the role of self-deception, but the apparent transition from evolutionary egoism to true human ethics still requires explanation.

My suggestion is that the development of true ethics is another example of the well-known mechanism by which selection can act on a character evolved for one purpose and adapt it to serve another. Whales' flippers and bats' wings were formed from reptilian feet, and mammalian ear bones from fish jaw bones, simply because evolution is a cumulative process, and the material available for new forms is determined by what has survived from previous forms. Animals are necessarily compromises of design (Eldredge 1995:46, Williams 1996), and their ability to take advantage of the opportunities opened up for them by environmental change is constrained by history and by existing genetic variability.

The process works as well on behavioural traits as on feet and wings. One of the most convincing explanations for the evolution of intelligence is that it allows greater memory for, and skill in computation of, the complex series of remembered transactions with known individuals that underlie the continually shifting alliances and reciprocal favours of life in a primate group. Brainier chimps are simply better players of repeated Prisoner's Dilemma. Greater skill in this is certainly rewarded by natural selection; for example, the alpha male of a band of chimps is not necessarily the strongest one, but the one best able to maintain a dominant position by the manipulation of alliances with others (Byrne 1995). Once evolved and further refined, as in modern humans, intelligence was available to be applied to cultural skills, such as abstract mathematics, astronomy - and theological speculation.

Similarly, the emotions that evolved to assist groups to maintain their cohesion by reciprocal altruism were available to be extended to what de Waal (1996:205) calls genuine community concern among chimpanzees (S 6.2.1). It is not, de Waal is

careful to point out, that these animals worry about the community as an abstract entity, more that they strive to maintain the kind of peaceful, co-operative community that is in each of their own best interests; but in evolutionary terms it is short step from there to modern environmental ethics.

I therefore suggest that, once evolved for related but different purposes, community concern allied with reflective intelligence, each favoured by natural selection because they enhanced the individual breeding success of our far distant ancestors just as orthodox evolutionary theory requires, became available to be refined into genuine, selfless altruism characteristic of the genuine spiritual world (Fig 3). Just as, with time and sociality (i.e., repeated encounters with the same individuals), the ruthless computations of the Prisoner's Dilemma game pass from "Always defect" to "Co-operation pays" (S.6.5), so has egoism in the primates passed from "Look after Number One" through "Scratch my back and I'll scratch yours" to "Love the Lord your God with all your heart, soul, mind and strength". Human ethics has thereby grown beyond dependence on its animal precursors. An appropriate biological analogy has already been supplied by Keith Ward, a theologian well-enough informed on the sciences to engage in public duels with Dawkins:

the soul need not always depend on the brain, any more than a man need always depend on the womb that supported his life before birth (Ward 1992:152).

The reason that the hard-line reductionists do not see this extension process working is because they refuse to consider *motives*. By locating morality outside nature, Williams and Dawkins have absolved themselves from trying to fit it into their evolutionary perspective, says de Waal (1996:16).

The reductionists' insistence on leaving bits out, such as questions of purpose and motive, is a metaphysical interpretation, not a necessity imposed by the data. Their case is insufficient: it is not possible to ignore the true motives and genuine ethical struggles that do really exist, and need explanation. The solution to the puzzle, says Ward, is clear:

if science rules out purpose by definition, and then finds that there are many things it cannot explain, one very obvious thing to think is that it is precisely the bits science has left out that we need to bring back in again...All we need

to resist is the idea that any natural science gives the whole, complete and exhaustive truth about the real world (Ward 1992:58-9).

The integration of multi-level selection theory and biotheology could in future offer suggestions on how to revise our view of Christian attitudes to creation and to the evolution of moral sensitivity in order to address questions of purpose *within* the constraints of mainstream science. For example, it is both impossible and unnecessary to deny the huge influence of genetic inheritance on human characteristics and behaviour - indeed, Jones (1996) maintains that, since genetics is often asked to test beliefs about what it means to be human, it is closer to moral and religious doctrine than any other science. But neither does this view deny the equally great influence of divine grace, however interpreted, in perfecting our nature, drawing it on into another stage unattainable by natural selection. "Morality", said C.S. Lewis, meaning the true, pure-in-heart sort, worlds above the mere score-keeping that can already be observed among chimps,

is indispensable: but the Divine Life, which gives itself to us...intends for us something in which morality will be swallowed up. We are to be remade. All the rabbit in us is to disappear....morality is a mountain which we cannot climb by our own efforts...[but] It is *from* there that the real ascent begins. The ropes and axes are "done away", and the rest is a matter of flying (Lewis 1971).

We need the help of God's grace to be able to "fly" – that is, to overcome the xenophobia and distrust of those outside our own group that is as much part of our makeup as is affection and co-operation with those inside it. This sort of universalism is exactly what is needed to weld humanity into a common unit capable of making collective decisions on how to deal with the environmental crisis, and perhaps the Fifth Mission Statement undergirded by a revitalised Christian theology of creation might be a powerful source of it.

10.3 The debate about stewardship

Christian theology has long squirmed under the repeated criticism, mostly but not only from outside the church, that Christianity is irredeemably instrumentalist in its attitude to nature, and therefore unqualified to address the issue of caring for creation in

terms that mean anything to modern ears. On the other hand, some theologians and philosophers such as Passmore (1980), Attfield (1983), Hall (1986), RJ Berry (1991) and Wendell Berry (1993c) have sought to show that the idea of stewardship is a neglected but legitimate strand in Christian tradition, so the arguments required to meet the modern need can be found within existing traditions. This approach has distinct advantages: as Passmore explains (p.40),

the degree to which reforms have been in the long run successful depends on the degree to which they have been able to appeal to and further develop already existing traditions.

By contrast, others such as Primavesi (1991:107) retort that the concept of stewardship is still exploitative and unecological, since stewards seek to optimise profits for themselves or their bosses. Primavesi criticises the “much-vaunted ” final document from the Basel conference (S.2.2) for stating that “Christian hope is the most dynamic stimulus to workfor the stewardship of all creation *for the benefit of all men and women*” [her italics]. She objects to the inappropriate “hierarchical thinking [that] encourages man to believe that he is ‘above’ or ‘in charge of’ his ecosystem. In truth, he now seems to be in charge only of its destruction” (ibid:94). Many other writers have made the same point, e.g. Sean McDonagh (1994:131) and Hallman (1994:6).

But resistance to any attempt to change the deep-rooted anthropocentrism central to Christian theology is strong. Rasmussen (1996:230-36) reports that, at the 1991 Canberra Assembly of the WCC, three paragraphs of a draft document referring to humans as “one species among others” were deleted because too many delegates objected that it offended the Biblical dignity of humans and the divine calling to stewardship. The report of the Board for Social Responsibility to General Synod 1991, which is an official document of the Church of England even though it states that it “has only the authority of the Board by which it was prepared”, is another example closer to Anglicans. It recognises that “Stewardship implies caring management, not selfish exploitation”, and even that “the world we manage has an interest in its own survival and wellbeing independent of its value to us” (Anon 1991:2), but then goes on to insist that “God has given to humankind the management of his world” (ibid:.4). It may be widely recognised that “we are not separate from and above the rest of creation, but part of its totality, sharing with other living beings their limitations and

destiny” (Gosling 1992:10); nevertheless we are the only part of it capable of taking responsibility for all of it.

The authors of the BSR report (Prof. R.J. Berry, the Bishop of Gloucester, Prof R. Moss and Rev Dr Ruth Page) were concerned to combat the danger of advocating a spirituality based on creation rather than on Christ, which obscures the clear Biblical distinction between God, humankind and the rest of the created order, and undermines the doctrine of stewardship. Does that imply that there is a logical difficulty preventing us from seeing humanity as *both* part of the natural world *and also* in some sense responsible for it? Certainly not, since it was R.J. Berry who coined the phrase “we are both a part of nature and apart from nature” (Berry 1993a:247). The solution seems to be to recognise the old biological imperatives affecting Christian ideals concerning the management of our own interests, but to integrate them with the newer idea that creation has interests and intrinsic values of its own. Even the Roman Catholic Church has issued a papal declaration that allows the idea of intrinsic value for all creatures, derived from God’s creative purposes (Edwards 1992:193).

In the concept of intrinsic value we find a welcome congruence of ideas between theology and secular philosophy. “Deep-green” philosophers have for some time disputed the traditional Christian instrumentalist view of nature, arguing that nature should be valued for its own sake (Sylvan 1992). Now theologians are rediscovering the same idea in the Genesis account of the covenant with Noah, which included the animals and all life (Birch, Eakin, and McDaniel 1990:277). Nevertheless, stewardship remains the dominant paradigm of environmental management, both in Christian (RJ Berry 1991, Peacocke and Hodgson 1996) and in secular (Attfield 1983, Passmore 1980) writings. The Brussels Code on environmental ethics, and the Anglican statement to the UNED conference in Rio, both quoted by R.J. Berry (1993a) emphasise both the human responsibility for stewardship of nature and the contemporary convergence in religious and secular ideas of it. The John Ray Initiative, recently established as a limited company and registered charity by Christians in Science (Appendix 4), states that its purpose is to promote environmental sustainability and responsible stewardship.

The main problem with all this is that good stewardship requires the weighting of all interests, which is especially difficult in any system in which the managers are also part of what is being managed. Weighting of interests is possible to calculate in

economic terms, as in the interdisciplinary study reported by Attfield (1996); and as advocated for New Zealand by Hartley (1997). Unfortunately, this approach has the serious consequence that importance values, which cannot be quantified, must therefore be underestimated, and so “much of what those who care deeply about the environment want to say will not be communicated clearly” (Grove-White and O'Donovan 1996). The intellectual basis of Christian concern for *nature as beloved of God* is not quite the same thing as the concern of secular environmental ethicists for the *intrinsic value of nature in and for itself*. Still less is it anything to do with the “production of a conservation output” (Hartley 1997:481). Future progress in designing conservation policies may depend on the extent to which we can forge closer co-operation between Christian, secular and business viewpoints.

The final document from the WCC World Congress at Seoul sticks to the traditional Biblical perspective, that creation is separate from God, in its declaration that “because creation is of God and *the goodness of God permeates all creation, we hold all life to be sacred*”, nevertheless humans are “created in the image of God with a special responsibility for the rest of creation”. The WCC thereby acknowledges an intrinsic value for creation, which is a considerable step forward. But, as one would expect from a Bible-centred organisation, the WCC at the same time distinguishes itself from deep ecology, which denies any special role for humans. Perhaps the case for protecting the environment can be best argued by an international, widely respected authority which recognises both secular and transcendent values, such as a revitalised Anglican Church.

The trouble is that the Biblical bases of key concepts such as the place of humans in nature or the ideal of stewardship are very much more complex than is usually recognised. All three possible human attitudes to the natural world (mastery over, subjugation to or harmony with nature) are present in the Old Testament, integrated into a single world view shared by all Israelites, though most individuals would have preferred one orientation over the others, depending on their sociological backgrounds (Simkins 1994:171). Palmer (in Ball et al. 1992) demonstrates the difficulty of defining a clear-cut Biblical pedigree for any general principle of stewardship, or of transferring one of the several scriptural possibilities without distortion into the modern world. More importantly, she questions whether any possible reinterpretation of the term is adequate or appropriate for the very different view of the relationship between humans and the natural world which is required in a modern, as opposed to a feudal, society.

For example, in both the Old and New Testaments the concept of stewardship appears in the context of a servant put in charge of the property of an *absentee* master. The application of that idea to humanity caring for creation carries the implication that God is far away, no longer present in the world - and further, that creation is an inert substance of little interest to God except as property to be managed in order to gain a good return as an investment. Neither idea squares with the equally ancient scriptural notions of God as delighting in creation in and of itself, long before the arrival of humans, or of the immanence of God in every form of life so intense that the whole of creation can be called, metaphorically, the body of God (McFague 1993). Worse still, the stewardship metaphor is responsible for the old idea that nature is somehow incomplete until it is put to use by humans. Hence the first settlers in US and Australia justified their taking land from the indigenous people who were not engaged in agriculture or visibly using the land in ways that they supposed God had intended it to be used (McDonagh 1994:131-2). Such incidents suggest that there is some truth in the philosopher Stephen Clark's description of the stewardship ethic as "licenced banditry" (Clark, unpubl.)⁴⁶.

An alternative approach to stewardship is advocated by Hall (1986:89ff). First, he draws a distinction between two primary interpretations of *imago dei*, the idea that humanity was created in the image of God.

1. The first and best-known, *substantialist* interpretation defines the image as those capacities or endowments of human nature that are distinct from other natures - especially rationality and freedom of will, both seen as the "stamp of the maker". This exaltation of rationality was foreign to Hebrew thought, but nevertheless it had a strong influence on later interpretations of Genesis in the Hellenistic world, and led to the claim that, since fallen humans were still rational, the effect of the Fall was to distort but not to destroy the image of God in humanity.

2. The second, *relationalist* interpretation holds that *imago dei* is not a quality of nature located in us, but a relationship: "to be *imago Dei* does not mean to have something but to be and do something: to image [verb] God", to be turned towards, to be in relationship with God. The effect of the Fall was that the image was totally lost, and the inevitable result was death. As in a mirror, we can reflect God when we are

⁴⁶ Clark stated this view emphatically, and defended it against several questioners, at a joint meeting of the Science and Religion Forum and the British Ecological Society, September 1996.

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turned towards God, even though we are small in comparison (a dewdrop can still reflect the sun); but when we are turned away we cannot.

In our state of estrangementwe no longer image God, not because we have lost some inherent quality of our creaturehood but because we are literally *disorientated* (ibid:106).

Hence all our thoughts and words and deeds, even the best and bravest of them, betray that broken relationship rather than reflect the source of our being.

There are profound implications for the Fifth Mission Statement in recovering the relational understanding of *imago dei*. It argues against the exaltation of rationality and responsibility, and the consequent denigration of other, irrational and irresponsible creatures; and it allows a critique of the ambiguous benefits of human reason. That is needed, says Hall, since

With our rationality in full cry, we have now created a technological society in which it is almost impossible to live like truly human beings...we have built a *civitas terrena* poised on the edge of oblivion (ibid:111).

Even more importantly, Hall sees a deep paradox in the idea of a Christian stewardship that makes no connection between the confession of faith that Christ is both Lord and image of the invisible God (Col 1:15) and the example he set about what lordship implies, i.e. humble and loving service. If we are to be conformed to his image and be incorporated in his body, we have to recover the concept of servanthood too, and "such a belief ought to transform the whole idea of human domination [=lordship] within the realm of nature". This sort of dominion can only mean stewardship, ultimately interpreted as self-giving love. That in turn would transform our values, from *dominion over* to *solidarity with*, from *power over* to *service to*.

How could this long-established alternative interpretation of stewardship have been so long ignored, and still be so unpalatable?

The answer is, of course, that the lordship of Christ was itself soon transmuted by imperially placed Christianity into something very different from the actual testimony to the life of the Lord given by the Biblical writers. Jesus was invested with all the trappings of earthly monarchy by an adoring

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church....the radical model of authority and majesty that Jesus as Lord actually embodied, with its intrinsic but unmistakable polemic against power, was all but lost to evolving Christendom.....The challenge issued to the Christian movement today by the crisis of the biosphere, namely, that it develop a more adequate theology of nature, is thus at the same time a challenge to develop a more authentic Christology...we have to recover a Christos whose lordship is [more human and] vastly different from the magisterial model preferred by empirical Christianity (ibid:185-7).

Hall's analysis thereby picks up the damning critique of Constantinian Christianity made by Kee (1982), and illustrates why meeting the environmental crisis is such an enormously threatening and far-reaching task for traditional theology. It simply has too much to lose. Over the long term, it illustrates why we should not simply take the easy way out and fall back on the stewardship metaphor, inseparable as it is from the mastery-over-nature syndrome, as urged by many influential voices in the churches today. But while the existing Church is in the process of rethinking its doctrine of creation and its place in society, which will take more time and will than it has given the job so far, the stewardship metaphor is a start, and a lot better than nothing.

PART IV A CHRISTIAN RESPONSE TO THE ENVIRONMENTAL CRISIS

11 ENVIRONMENTALISM AND THE INSTITUTIONAL CHURCH

The Anglican Church is not generally known to take a leading role in the environmental debate, in New Zealand or elsewhere: indeed at the level of the ordinary person-in-the-street it is often seen as, at best, having nothing to contribute, and at worst, as being downright hostile to the natural world. This is mainly a public relations problem for the Church, because in fact there is a certain amount of work on environmental matters going on behind the scenes. I am convinced that the common opinion is wrong, that the Church does have a vital role to play, one which does not depend on defending the outdated theologies that many people now reject. But to earn a hearing at the debating table, the Church will first have to make itself relevant to outsiders - most especially by consolidating the contemporary insights and knowledge of many different people and disciplines into a new and coherent theology capable of undergirding the Fifth Mission Statement. Knowledge does not, in itself, lead to right action, but it makes the knowledgeable who do nothing responsible for disaster, as were the prophets.⁴⁷ Therefore, the environmental crisis is both an enormous opportunity and also a strong challenge to today's Church (Houghton 1997: 110).

The first thing to consider is to what extent the Church in New Zealand can fulfill the contemporary equivalent of that ancient prophetic duty. That does not mean returning to ancient attitudes - on the contrary, it means looking at them more critically in the light of modern needs. For example, we must take seriously the comment by Lynn White, that, to the extent that the fundamental values of Christianity have long

⁴⁷ I refer specifically to the Anglican Church here simply because the subject of this thesis, the Fifth Mission Statement, is an Anglican document. There is too much diversity of belief in modern Christianity (and indeed within Anglicanism) to allow any more general statements. Even WCC cannot speak with a single voice for all Christians. Perhaps greater progress in ecumenism will have to precede the following programme.

influenced socio-economic patterns of western society, we cannot get out of the present environmental crisis *until* we “find a new religion, or rethink the old one” (White 1967:1206). Most Christian writers ignore the challenge of such a drastic re-evaluation of our faith, whether or not they agree with White’s identification of Christianity as the root of the problem. But ignoring it means to continue with what Rasmussen calls the “serious mistake” of Christian theologians of the second and third centuries onwards, who thought that they could find their way to God through the contemplative mind, abandoning material reality in a preference for pure spirit, and progressively falling out of love with earth in the course of nurturing soul, mind and reason. Now,

Experiencing the gracious God means.... falling in love with earth and sticking around, staying home, imaging God in the way we can as the kind of creatures we are....If Christianity does not demonstrate a power that addresses earth’s distress and makes for sustainability, its claims to be redemptive ring hollow (Rasmussen 1996:280, 272).

Surely we must be able to find ways to do this.

11.1 The role of religion in the environmental debate

It is supremely ironic that, while so many local church communities are widely seen to be, and many see themselves to be, irrelevant to and disinterested in environmental problems, it is becoming increasingly clear that religion has an important role to play in the debate. To quote only a few writers who have already made this point:

There is something like a religion embedded in our commitment to growth and modern industrial progress. For if it is true that we are committed to these values to the extent that we cannot live without them.....they have become ultimate and absolute...in a peculiarly modern sense they have become our gods....But our profound belief in those objects has made us insensitive to the damage they are doing to that alienated world of nature on which in fact our lives primarily depend.....This makes our crisis a spiritual one (Ambler 1990:53-4).

The changes that are now needed in society are at a level that stirs religious passions. The debate will be a religious one whether that is made explicit or

not. The whole understanding of reality and the orientation to it are at stake. to ignore that, to treat the issues as if they could be settled by abstract reason, is misleading.....Getting there, if it happens at all, will be a religious event, just as getting to where we are now was a religious event. Idolatryhas brought us to the present crisis. Overcoming [it] is a religious task (Daly and Cobb 1990:374-5).

Daly and Cobb refer, of course, to religion in general, not to any particular set of doctrines. Rasmussen (1996: 182) more specifically refers to Christianity as:

a particular religious worldview, and a way of life in keeping with it, [which] when armed with the powers of modern technology, will do us in.

Such comments might be thought to give aid and comfort to the church's missionary effort. Alas, the reality is quite otherwise: Rev. Kelvin Wright frankly admitted to me (in conversation, June 1996) that the Fifth Mission Statement was practically irrelevant to his [then] work as Chaplain for Missions in the Diocese of Waikato.

Some authors, such as the philosopher Loyal Rue (1989:5) admit that the church seems too hidebound and too complex to respond to such an immense challenge. Yet Rue remains convinced that "the church is really the best place to start the work of revitalising western culture" (ibid:184). He recognises the objections, but

I see nothing to be gained by giving up on the church; it will not go away. And if the church itself is not brought to make a radical departure from the past, then it will remain a formidable obstacle to any revitalisation attempts centered outside the church. The task....is to be accomplished not by leaving the church, but by changing it radically" (ibid:5).

Oelschlaeger (1994) describes his book *Caring for Creation* as a confession, an account of a conversion experience. Influenced by Lynn White, he was once strongly prejudiced against religion, but he eventually came to the opposite conclusion. He recognises that all politicians and secular experts are part of the economic system that treats the public good as a by-product, if that. Organised religion is part of the same system too, to some extent, but in its best moments it is more concerned with the welfare of the group and the collective good than is any other institution. So, he concludes, the church is our last, best chance. He states firmly that "There are no

solutions for the systemic causes of ecocrisis, at least in democratic societies, apart from religious narrative” (p. 5).

Oelschlager builds a strong case for his view that

The metaphor of caring for creation is literally an instrument for social transformation: it is an instrument of moral and intellectual growth...not a theological rule but an imaginative paradigm that might prove useful for a culture undergoing ecocrisis (ibid p. 222).

Oelschlager acknowledges that religious metaphors are ordinarily associated with skyhooks – privileged metaphysical claims – rather than environmental ethics, but he does not explain how to use a metaphor to persuade people to co-operate to achieve public benefits. He mentions the Tragedy of the Commons briefly but does not explore its consequences or how to escape it. He does not discuss the forces of co-evolution at all, except in the broad statement that “the controlling memesof industrial culture must be reshaped” (p. 230). His analysis is unusual in the Christian literature for getting close to recognising the key dimensions of the problem, but his suggestions for dealing with it are impractical.

Nevertheless, as a Christian, I agree that Oelschlaeger is on the right track, a parallel (American) one to the Anglican initiative represented by the Fifth Mission Statement. On the other hand, as a scientist I am also concerned that the Church should be careful how it takes up its role in the debate, considering that it is a latecomer to this particular field. The development of research concerning the environmental crisis is much more advanced in the secular world than in theology. During the long period when, as Moltmann put it, theological and secular thinkers achieved a peaceful co-existence based on “mutual irrelevance” (Moltmann 1985), all the foundations of the present secular disciplines of conservation biology and environmental ethics were laid without any input from theology (see, for example, Caughley and Gunn 1996, Passmore 1980). The existing system of national parks and reserves that protects many of the most significant landscapes and natural habitats around the world - which could not be established *de novo* in contemporary conditions - owes nothing to theology. If “the ecological crisis is ...a *kairos* moment” for the church, as McDonagh (1994:145) maintains - a moment of decisive challenge during which matters of great good or evil will be decided - then it is as well that others woke up to it sooner than the Church has done.

By contrast, most other current Christian literature on the environmental crisis starts from the argument that Christianity was green all along, so all we need to do to put things right is to revive the old idea of stewardship. These ideas are useful and to some extent true, but they are deeply unsatisfactory. Behind them there is a more important point that all such conservative arguments seem to miss. The various contributors to one book, entitled *The Earth Beneath: a critical guide to green theology* (Ball et al. 1992) put their fingers on it. They take the view that it is not enough merely to discuss how humans have been treating the natural world: that is of course important, but behind that problem there is a deeper question, about the identity and place in nature of humanity itself.

Religious authors too often attempt to "domesticate" the environmental problem, by redefining it in terms acceptable to tradition. Reinterpretations of Genesis avoid the embarrassment of acknowledging the complicity of established religions in the destruction of the earth's resources, by pretending that scripture and tradition have always been environmentally friendly but have simply been misunderstood by all previous generations until now. This tactic disguises the radical nature of the challenge of environmentalist groups, and so limits their impact.

It is far easier and safer to try to contain the challenge of 'green' theology within existing boundaries than to be open to the possibility that what it really requires is a complete re-think of traditional Christian attitudes. It is our argument ... that most of the material that has been published so far has gone for the safe option, that of reinterpreting our existing language. We will suggest that what is needed is something new and as yet undeveloped. If Christians are to share in that process of development they will need to.....be prepared to let go of ideas from the past that are no longer adequate (Ball et al. 1992:4).

This theme can be developed in various directions. Robin Grove-White argues that there are two different ways of thinking about the environmental crisis. The orthodox one stresses the role of science in understanding both the problem and the human reaction to it; the alternative account stresses the central role of human relationships and cultural contingency. The two are not, he believes, equally valid. The orthodox view, which is based on a common but seriously inadequate conception of a human being as a "rationalist-individualist calculator" (Ball et al. 1992:24) - what Daly & Cobb (1990:85) call "*Homo economicus*", as discussed in S4 - is itself part of the problem, whereas the environmental movement is better understood as a "vehicle for

the reassertion of public, collective values in societies whose individualism has overrun its course" (Ball et al. 1992:31).

Margaret Goodall and John Reader (in Ball et al 1992:36) agree with this argument and expand it further: "The real question is, 'What is it to be a human being?'" They suggest that part of the pressure to consume, which is so damaging to the planet, can be seen as an escape from a deep ontological insecurity. One very common response is to retreat into the familiar past, regardless of its problems; but that poses a particular problem for Christianity, because its heavy investment in the past is no longer considered an asset by some, especially the more outspoken of the feminist groups. At the same time Christians must combat the false optimism of New Age philosophy - that loose collection of ideas including the belief that humanity can save itself, and that it is not necessary to take evil seriously. Failing to recognise good and evil as separate, or to provide some means of dealing with personal sin, prevents personal growth (ibid: 57).

There is another problem, too: there is a perceived contradiction between the feeling that we should take responsibility for, and do something about, environmental degradation, and the opposite and much older belief that God is in charge of all history. In the absence of any firm teaching or leadership from within the church, the majority become reduced by confusion to moral passivity. As Hall (1986:50) puts it:

How can we speak about God's sovereignty without undermining human accountability? ...How shall we think of human responsibility without betraying a covert atheism?.....Time [once] permitted us the luxury of theological debate....But today the whole church is confronted by the need, unprecedented in history, to develop a theological praxis enabling it to bring to bear on a threatened globe not only its own undivided service but also a wisdom that is sorely needed within society at large.

As the secular green lobby has been saying for years, it's later than we think.

11.1.1 Green grace and red grace

The history of Christian traditions about nature are comprehensively surveyed by Paul Santmire (1985). He shows that the exploitative theme criticised by White has from the beginning been countered by another, equally ancient but less well known theme

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affirming the intrinsic value of the natural world and the presence of God in it. The implication is, says Ray Galvin, that the Church *is* guilty of aiding and abetting the environmental crisis, as White claims - not because Christianity caused the problem, but because it has neglected those elements of its own traditions that “could have helped save the day” (Galvin and Kearns 1989).

Within the various strands of modern Christianity, there is such a broad range of different understandings of creation that it is now unrealistic to hope to formulate a Christian theology of creation for the future. The best we are likely to achieve is a series of locally relevant but linked variations on the basic theme. Christians must also formulate their understanding of the natural world in terms comprehensible to people outside the churches. While the need for working together on conservation issues is so urgent, it is necessary to concentrate on what *unites* Christians with each other and with and non-Christians, rather than what divides us. Perhaps we could agree to use Jay McDaniel’s useful term “green grace” to describe the truly numinous in creation (McDaniel 1995). This concept is understood by anyone who has experienced it, religious or not, so it might be useful to recognise its value in stimulating and supporting the changes in western life-style that global conservation demands.

However, if the churches want to make a serious contribution to the environmental debate, they must also continue with their ancient duty to mediate what McDaniel calls “red grace” to the world, especially through the Eucharist, and do it with more love and acceptance of other points of view, more tolerance and less concern with personal righteousness, more emphasis on peace and joy and less on sin, more on intellectual rigour and less on dogma, than they have in the past.

The churches have had centuries of experience in the business of building communities, places where people find the sense of personal identity and community solidarity that drive concern about, and offer solutions to environmental issues. The changes I advocate do not mean abandoning all tradition, but they do mean taking both creation theology and ecological science very seriously indeed. In Philip Hefner’s apt analogy, the story of cosmic evolution, from the Big Bang through to the very recent appearance of human culture, provides the loom on which we can weave a new interpretation of the perennial mystery of who we are and what we know. Faith can use the loom to weave together the stories that yoke science and religion together in a new cosmic myth for our time. The loom is not the weaving, but the

weaving is not possible without the loom⁴⁸. We can see the loom as part of the vision, constructed on purpose for it, but the weaving is done by a leap of faith, and the cloth is a celebration of nature.

11.1.2 Game theory and environmental agreements

A common response to any convincing explanation of the environmental crisis is: “Now what do we do?” Religious authorities are perhaps better placed than most to point out that there are two levels of answer: one, we have to change the economic and political environments in which we live, and two, we have to learn to change our own individual lifestyles. The Anglican Church is already active in the multi-disciplinary and much-needed critique of the current economic and political paradigms, and lists of “What you can do as an individual” are widely available from green organisations and academics (Wyman et al. 1991), but nearly all such efforts fail to take into account the problem that knowledge does not lead to virtue in a society in which ignoring virtue is a profitable strategy. Exhortation, however authoritative and well-intended, cannot make a difference if it ignores what game theory can say about how people make personal decisions, especially those involving resources.

Throughout their formative years, our ancestors lived in small, homogenous groups in which every individual was familiar to every other one, and all had a stake in the survival of the group. Where all members of a group have interests in common, co-operation is beneficial to all, and constantly reinforced by evolved social attitudes forged and maintained by deep-rooted habits of reciprocal altruism available only to other members of the same group. Competing groups were independent of each other, and generally hostile (Campbell 1975). But modern human society has become very diverse and complex, so the ancient rules generate tensions both within and between the main groups (e.g., nation-states and political or trading blocs).

National and international agreements on ethical issues need co-operation between diverse groups or subgroups with different interests, hammered out against the grain of the built-in human tendency to try to score points against members of other groups

⁴⁸ Hefner explained this metaphor in his address to the 1996 annual conference on “The Epic of Evolution”, run by the Institute of Religion in an Age of Science on Star Island (New Hampshire).

(Alexander 1987). The key problem in environmental ethics is to persuade individuals voluntarily to extend meaningful co-operation, and enough of it, to others *outside* their own familiar groups, even though that defies the ancient “default setting” (S.6.2) of human nature (Heinen and Low 1992) . Game theory explains why: caution, lack of trust, suspicion of concealed motives, unwillingness to allow the other side any advantage, total intolerance of foreign free-riders combined with tolerance of free-riding at others' expense, have been the best way to negotiate with other groups for virtually all human history until now.

The game theory approach applies as well within nations as between them. For example, consider the matter of litter in and around any modern city such as Hamilton. The citizens as a group would benefit if *everyone* were responsible about litter; if no-one ever dropped rubbish in the street or condoms in the bushes, or threw burning cigarette butts out of their car windows, or dumped trailer-loads of junk at the side of the road. The city council would save the thousands a year it now has to spend on cleaning up assorted messes in public areas, the parks and central city business area would be more pleasant to look at and walk in, the risk of disease and damage from pests would be minimised, and everyone would benefit for the expenditure of minimal personal time and self-discipline. But it does not happen. Why not?

The decisions made by any one member of a group depend substantially on the decisions made by the other members. Text Table 4 sets out the options in the form of a game in which I play as an individual against the rest of the citizens as a group. Since I cannot know all of them individually and am unlikely ever to meet them all as a group, this is the equivalent of a one-off Prisoner's Dilemma game. For the moment, it assumes I have no strong principles either way about litter, but am merely objectively calculating my options. The table shows that, if everyone obeys the rules the city is clean, though everyone shares the cost of personal self-discipline. My personal result is better if I defect when everyone else is co-operating, because I then enjoy a clean city without having to change my own habits. But if I co-operate and others don't, I risk having disciplined myself for nothing, in which case I might as well save myself the trouble and contribute to the mess along with everyone else. So whatever everyone else does, my best strategy is to carry on as normal. The result will be a local version of the Tragedy of the Unmanaged Commons (S5).

Text Table 4 Game theory analysis applied to the question of why not everyone living in a city will co-operate to achieve a public good

The aim is to reduce the cost, health hazard and aggravation caused by litter in the centre of a modern city such as Hamilton. The decision payoffs are calculated with reference to any one individual (“what I do”) playing against the rest of the population as a group (“what you do”), ie, the table is to be read from the left in rows, rather from above in columns. Co-operation is defined as always using the council litter bins or taking my own litter home; defection as the opposite behaviour. The same argument can be extended to other forms of “litter” such as graffiti and vandalism. The scores allocated to each outcome (in brackets) are arbitrary but in about the right order of desirability.

		What you do	
		<i>Cooperate</i>	<i>Defect</i>
What I do	<i>Cooperate</i>	I enjoy a very clean city at the cost of some self discipline (3)	I suffer the visual pollution even though I have been self-disciplined (0)
	<i>Defect</i>	I enjoy a mostly clean city and save myself the trouble of self discipline (5)	I suffer the visual pollution, with the small consolation of not have to be self-disciplined (1)

In real life the people who live in any given city are not a single, homogenous group. There could well be a large difference in attitude between those who inhabit, for example, the up-market suburbs versus those who live in the poorer areas, or between those who own their own property and pay rates versus those who only rent. For the sake of this argument, we could call the two groups the Blues and the Reds. Many of the Blues would perceive themselves as stake-holding members of the community with an interest (at least in theory) in the welfare of the city and its community. They are sensitive to visual pollution so would benefit from greater community co-operation over litter in public places, and most would never dream of

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dropping litter in the street. By contrast, the Reds are more likely to see themselves as having no stake in the community and nothing to gain from putting themselves out. They are often insensitive to mess, uneducated or unmotivated about civic responsibility, and have nothing to gain from a reduction in litter since they are not offended by it.

Controlling the litter problem by citizen's responsibility alone would require full co-operation between all sectors of society. But co-operation between groups depends on the degree to which they share common interests, whereas it is more likely that the Blues and Reds will have different attitudes to litter, which will affect their weighting of the options. Blues are much more likely to value co-operation on principle, even at personal inconvenience; Reds are much more likely to defect - and not only by failing to co-operate. Reds who feel they have no stake in the community because their interests and concerns are ignored by the other stakeholders may also use litter, graffiti and vandalism to damage public amenities that Blues value. The local variation in proportions of Blues and Reds will produce different combinations of outcomes for the litter problem in different suburbs.

The problem of litter in public places is a simple one but similar in principle to many others faced by the Fifth Mission Statement. The cause is often seen to be ignorance - a failure of schools and parents to teach civic responsibility to children. In that case the appropriate action would be an effective public education campaign, but this analysis casts doubt on that strategy. The Blues, who are already responsible about litter, put a high value on co-operative behaviour in all circumstances, and the Reds put so low a value on it that they are not likely to incur the cost of self-discipline merely in response to exhortations. Clearly, defection is the safest option for the least privileged parties in a structured society in which some members have a lot less to gain from co-operation than others. No-one will support a society, or help keep its streets clean or listen to its elected representatives, unless they feel part of it, which is why general appeals for co-operation on matters such as civic responsibility and public consideration *never* get a 100% response.

On the global scale, the same logic applies. The present urgent need for groups to trust each other and work together at unprecedented levels does not alter the way we think, itself forged over thousands of years' experience of a very different world. The tensions and bickering at the Earth Summit in Rio, are proof of that. There, the differences between the participants, in wealth, ethnicity and social status, were huge,

and the processes by which social inequity undermines co-operation were even clearer.

On the other hand, the churches are not much better than secular organisations at promoting naturally-evolved co-operation *within* groups, which is part of social life everywhere. There is a sense in which every congregation is a social unit no different from a bridge club, and personal tensions are rife in both. But churches could be in a better position than most secular organisations to help overcome the barriers to co-operation *between* groups. Those barriers include racism, moralism, local and personal self-interest, lack of confidence in others' good will, and many other evils that Christianity officially abhors but actually often practices itself. Given the right circumstances, the Church is able to mobilise broadly humane sentiments across society in order to make a coordinated contribution to the public debate – as the Hikoī of Hope demonstrated throughout New Zealand during September/October 1998. Elsewhere, the churches have made important critiques of public affairs in the Phillipines, Brazil and US, always working towards peaceful revolution and playing down old antagonisms (Martin 1997:220). A Church that truly lives up to its founders' values, that deliberately rejects the old moralistic, doom-laden attitudes and concentrates on its real work of transforming people by grace, *could* make a difference.

11.2 The role of the Church in meeting the approaching catastrophe

No informed parties to the environmental debate continue to believe that it is still reasonable to expect Northern life to continue as it is now into the indefinite future. Secular environmentalists are finding that, despite decades of rhetoric, direct action and a few battles won (such as cleaner water and more recycling in rich countries), not a single major aspect of the global ecological crisis has yet been reversed. The 1990s was identified by many (S1.1) as the last critical decade for implementing the changes that might save the world. The Final Document from the Seoul Convocation on JPIC stated that “Unless far-reaching changes are made *now* [1990], the crisis will intensify, and may turn into a real catastrophe for our children and grandchildren” (Niles 1992:165). Now we are within a few months of the turn of the millenium, yet still, little has changed.

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The mental image that comes to my mind is of a bus marked “Free-market economy”, which is hurtling along a road through a city called “Utopia”. The driver wears earmuffs, dark glasses and a broad grin, but his attention is more directed to what is going on among the passengers than on the road ahead. Blazed across his shirt is the single word “GROWTH”. Inside the bus, the seats all face backwards, and are occupied by dozens of representatives of social and environmental agencies arguing, drinking, reading, playing cards, or sleeping - but none ever looks out of the windows



Fig. 4. Cartoon drawn especially for this thesis by the Wellington cartoonist Brockie.

of the bus, and if they did they would see only where they have been, not where they are going. (As (Wolpert 1992:171) points out, we enter the future backwards). Along the road sides are a few mouse-sized protestors holding up placards saying DANGER AHEAD or STOP! but they are ignored. Their carcasses litter the road behind, but are too small to be noticed. In the distance the road ends abruptly at an immense cliff face labelled “Collapse of western civilisation”, and there is no ambulance at the bottom (Fig. 4). For a little while longer, the present Church can choose whether it will place itself among the inattentive passengers, or among the mouse-sized protestors; the future Church seems unlikely to be able to avoid sharing the bloody mess at the bottom of the cliff.

It seems to me that the approaching crisis is about to put the Church in a unique position in contemporary and future society, for three reasons.

The first reason is that, while our options are still open, the Anglican Communion's deep roots in, and influence on, both South and North put it in a good position to help mediate in the conflicts between the haves and the have-nots which have already changed most Northern societies out of all recognition, and are bound to accelerate in future decades. As those tensions increase, we might recover the full meaning of those subversive words of the Magnificat, which in our day are deadened by repetition and inaction: "God has put down the mighty from their seat, and exalted the humble and meek; God has filled the hungry with good things, and sent the rich away empty". If the Church is serious about the Fifth Mission Statement, it needs to recover its pre-Constantinian prophetic function, to comfort the afflicted and afflict the comfortable.

The second is that intelligent action on the environmental crisis depends on our developing some way to *interpret* the role of mankind in first causing, and now, maybe, managing the troubles we now find ourselves in. We need a credible theology of humanity capable of taking a loving but coolly realistic view of human nature. Rational Christianity can integrate the scientific account of the evolution of true human morality from its amoral animal beginnings with its own understanding of the extremes of human behaviour, from the seldom-attained heights of sanctity to the all-too-often plumbed depths of evil. This perspective can offer realistic answers to questions such as: Why do environmentalists' exhortations to responsible living so often fail? Why is earth care not the first concern of everyone? Much more than any secular environmental agency, the Church has long experience and deep understanding of every form of the multiple sins that are now arguably threatening the survival of the species.

Humans, in covenant with God, need to impose a moral order on largely amoral nature, including their own....[they] are co-participants in an ongoing transformation of creation so that the future might yet be better, from the standpoint of justice, than the past (Rasmussen 1996:244).

The third reason is that, alone of all social organisations in the world today, the church in its various forms has lived through two previous experiences of social

disintegration, once during the sack of Jerusalem in 70 CE, and again during the fall of the Roman empire and the centuries immediately following. The loss of Jerusalem was certainly the end of the world for Jews, even though the rest of civilisation was unaffected. However, the impact of the collapse of the central rule of Rome on life around the Mediterranean in the fourth and fifth centuries must have been equivalent to that which a global collapse would have on us now. At that time, the church survived and even expanded into new areas, and where the clergy were able to influence the new secular leaders of the day, they were often able to persuade them of their religious and moral responsibilities as rulers. And even where such influence was not possible, bishops or monasteries could often provide in their immediate areas a measure of charity, justice, education, and above all spiritual leadership (McManners 1992). Secular organisations based on power politics seldom long survive tumultuous social change, as game theory predicts (S.6.4) and as the recent history of events in eastern Europe has been amply confirming. But in the Rome of the past, the Poland of the present and, maybe, an England or New Zealand of the catastrophic future, an authentic, realistic, suffering and caring Church will thrive and continue its vital support work as it has done before.

Whether Jesus intended to found a new religion or not - and the argument of Sheehan (1988) is that the early church distorted the message he came to give Israel about the Kingdom of God into a totally different message about Jesus himself - his Church did survive the collapse of Rome, at least partly because it focussed the grace of God on the vital role of community life in establishing the local co-operation that helps people face massive social transitions.

By the grace of God the Church has access to sources of strength and meaning that are independent of the present world order. If our best efforts cannot actually prevent the massive threatened damage to the natural world and to society, the Church will be in a key position to help alleviate the consequences. When that future crisis comes, the Church should not only be able to stand, but it should also be able to combat despair with Christian hope by building genuine community among the remnants, and to take a longer view of events than can those whose concept of ultimate reality is more materialistic. Herman Daly, a level-headed, religious and knowledgeable man formerly working in the thick of the action at the World Bank, summed up an appropriate attitude for the informed Christian contemplating a bleak view of the distant future as follows:

I make a distinction between optimism and pessimism on the one hand, having to do with the betting man's expectation based on evidence; and on the other hand, hope and despair, the existential/religious attitude one imposes on the situation. I think one can be hopeful and still pretty pessimistic (quoted by Athanasiou 1996: 56).

Rational faith supplies ultimate sanity in a threatening world, a defence both against despair and against apocalyptic unrealism. Daly would no doubt feel at home in the church of the future, which Hall (1986:160) envisages as:

no doubt numerically reduced but also less beholden to worldly powers and superpowers, [it] will prove the one inter- and trans-national movement capable of upholding and communicating a vision of world community that is not just another cloaked ideology of empire.

Daly and Hall both know that it is possible to trust in God without denying tragedy - and so does anyone who has lived through any sort of personal trauma. We need only read the book of Lamentations, written after the destruction of Jerusalem by the Babylonians in 587 BCE, to get a foretaste of what a total social collapse would be like. But the Jews never abandoned their cultural identity or their hope in God; they survived, and in time they returned to rebuild Jerusalem. The history of Judaism shows that to trust God is not to opt out of reality, but to choose genuine hope rather than either cheap confidence or fatalism.

If the worst comes to the worst, will that necessarily destroy our concept of the loving purposes of God? Not if a more humble Church of the future has a believable theology of a patient, loving and suffering God who gives us freedom to determine our own goals and then shares the consequences with us. Not if that Church's own life and liturgy helps people to recognise that humanity will have brought tragedy on itself, and cannot attempt to escape responsibility by blaming God for it. And not if, having done what is possible to change what can be changed, individuals accept what cannot be changed and make the decision to live differently while they do live, to live as if life matters while they have it, and to live with integrity in the light of the brutal reality that will define that not too distant world (McFague 1993:208). Spiritually aware people have lived with honour through the many smaller-scale catastrophes of the past, and those of the darkest future will still have the option of doing the same. The only option that will not then be available, as people survey the effects of human activities on a ruined planet, will be a church which continues to teach its new

members that humanity is the crown of creation. And the final loss of that option will be no bad thing.

11.2.1 Implications of church-led social activism for theology

Any programme involving the Church in political action in modern society must start by seriously considering the Church's own position in society and in business. Christianity started small and strongly democratic; all important decisions were made by discussion and/or vote, from the replacement of Judas Iscariot to the choice of the first deacons (Acts 1:26, 6:5). But after Constantine, the church came to be organised by a hierarchical system of government which paralleled the administration of the state (Kee 1982:167). Primavesi (1991:100) has pointed out that the consequences of this hierarchical (and, inevitably, also patriarchal) thinking were to reduce the status of women and of the natural world, and thereby to contribute to the environmental crisis of today. The Catholic Church is still organised on the model of Constantine as God's representative, sitting above the council of bishops. It is a model that has served the church well, but it does not spring from Christian values, which are grounded in the revelation in Christ that God does *not* act as do the kings of the earth (Mat.20:28). But, by what Kee calls a "triumph of ideology", Constantine's view prevailed, and ever since then, the established church has been associated with the aristocracy.

That strategy been very successful for centuries - at least, if a successful church is defined as one having power and influence in society - but in the very different world of today it is becoming an obstacle in the path of the church's real mission. Hall (1986: 231) puts it bluntly:

Where churches have sufficiently de-Constantinized themselves to become distinguishable from the dominant classes of their host societies, they are able to overcome much of the harm.....[and] join in international quests for peace without succumbing to the ideologies of politically-motivated peace movements; together with other human agencies, they can achieve humane, economic, ecological, human rights, and other goals, and help build trust between mutually suspicious and competitive governments and movements.....[the church's] greatest challenge is to extricate itself from the Constantinian quest for power through proximity to power, and to elaborate a gospel and ethic that is truly world-affirming.

The Christian understanding of God originally emphasised Jesus' message of special concern for the poor, but history has shown that when Yahweh is detached from his historical identification with the history of oppressed peoples, he soon becomes the god of their rulers (Theissen 1984: 72). So the churches in the North have not yet come to grips with the degree to which Christian theology and tradition are implicated in the development of the economic models that have dominated our societies and attitudes since the Industrial Revolution (Hallman 1994). Until Christians accept that, and work to change the public perceptions that link the Church with those who have had more to do with implementing current economic policies than with suffering from them, our impact on the contemporary social and environmental debate will remain limited.

A very recent and clear example of the consequences of those public perceptions arose during the debate stirred up by the Hiko of Hope. The Church's moral authority to lead the Hiko was to some extent undermined by accusations of hypocrisy. How could the Anglican Church, itself a large property-owner charging market rents to its tenants, presume to criticise the Government for doing the same? How can Anglicans decry poverty among the people while at the same time spending huge amounts on maintenance of its own buildings, including \$20 million on a new Cathedral in Auckland?⁴⁹ The huge amount of good done by the Anglican Social Services, Anglican schools and similar organisations gets little balancing publicity. The Church's institutional position and history are very much mixed blessings to those of its members attempting to implement the Fourth and Fifth Mission Statements in the contemporary world. This is a problem that needs urgent attention.

11.3 A programme suggested by gene-culture co-evolutionary theory

The concept of gene-culture co-evolution accepts genes and culture as separate but not independent lines of transmission of information down the human generations (S6.3). Gene-culture models assume that genetic and cultural fitness functions both

⁴⁹ Former Prime Minister David Lange, interviewed by Paul Holmes on TV1 on October 1 1998.

reflect the interacting consequences of variations in the social environment on the dynamics of transmission of genes and memes.

Consider, as an example, my classification of the range of different cultural attitudes to environmental matters summarised in Text Table 3. My scheme was quite deliberately simplified, in order to make it easier to perceive the general pattern, but my own classifications were not quantified, which makes it more difficult to explore the implications of gene-culture co-evolution for the Fifth Mission Statement. Fortunately, it so happens that there was a very extensive survey of New Zealander's religious beliefs and attitudes in the mid 1980s, which included documenting the extent of agreement with three quite appropriate statements on attitudes to the environment (Webster and Perry 1989). They were:

1. We should conserve our natural heritage even if that requires us to accept a different [=lower] standard of living.
2. We should develop our natural resources even at extreme cost to our environment.
3. We are spending too much on improving and protecting our environment.

Statements 1 and 2 reflect the approximate positions of idealists and of commercialists, respectively. The percentage of people agreeing with each statement is therefore an estimate of its cultural fitness – that is, the

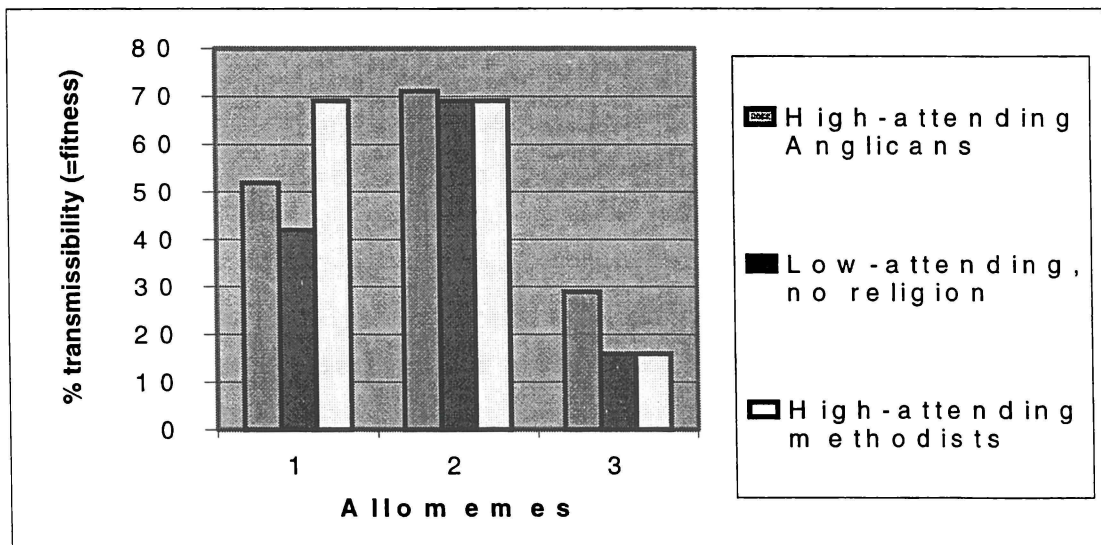


Fig 5a: The relative cultural fitness of opinions on environmental conservation surveyed within the churches of New Zealand by Webster & Perry (1989). The allomemes define the extreme positions on the preservation-use spectrum shown in Text Table 3. Allomeme 1= idealist position, 2= moderate position, and 3= commercialist position. Total sample 1106.

transmissibility of each idea among the various population subgroups identified. Statement 3 represents a middle course, in that it identifies what proportion of the population are willing (or not) to spend more money on conservation, but does not mention the possibility of having to accept a lower standard of living. Since the statement is phrased as the negative of any conservation position (“we are spending too much..”), I have taken the figure for the proportion that disagreed as an estimate of the cultural fitness of the statement “We are not spending enough...”.(or, perhaps, “we are spending the right amount”). The results are plotted against the spectrum of conservation attitudes in Fig 5a.

The data are broken down by religious denominations, and then into levels of weekly attendance (high or low). About half the high-attending Anglicans (52%) agreed with the idealist view, a higher proportion than among those who declared no religious belief and never went to church (42%). The strongest agreement for this statement came from among the high-attending Methodists (69%). At the other end of the scale, support for the opposite, commercialist proposition was weakest among both high-attending Methodists and unbelievers (16% each) but strong among high-attending Anglicans (29%). Webster and Perry comment that this distribution of results seemed “unlikely”, but it could be easily explained if the unbeliever group included many very active conservationists for whom the Church is irrelevant, while the high score for Anglicans could reflect their “Establishment” membership and their general acceptance of compromise with the politics of the real world.

In the middle category, all three groups were clustered together across a small range of scores (69%, 69% and 71% disagreed with the proposition that we are spending too much on conservation). It seems that the extreme hard right attitude so much beloved by recent governments, and even more so by would-be reformers of DoC (Hartley 1997) is not widely favoured by New Zealanders inside or outside the Church. On the other hand, it would be hard to discern any sign in these data that Anglican beliefs have any positive impact on the transmissibility of allomemes favouring the conservationist cause.

Fig 5b is a thought experiment in which the actual scores for high-attending Anglicans – the target audience for this research - are plotted against the predicted genetic fitness of the genotypes associated with that distribution of allomemes, and also against the possible scores that might be recorded if the survey was repeated at a

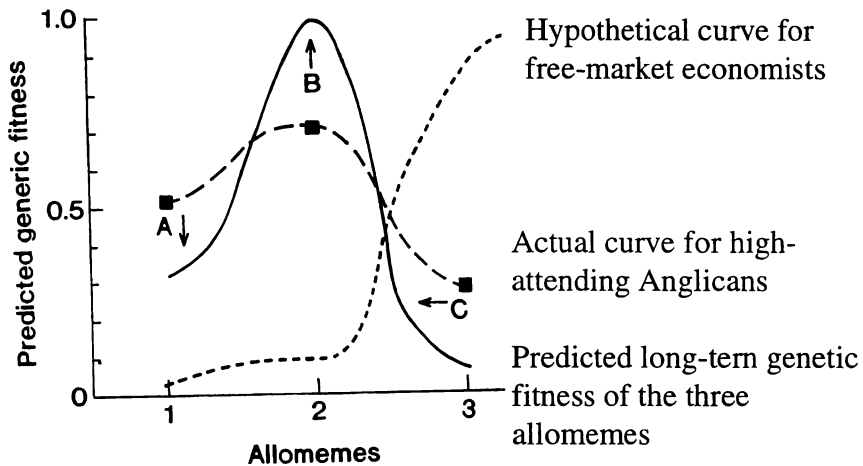


Fig 5b: A thought experiment. To bring Anglican practice closer to what needs to be done to promote the common good, we should argue against both ends of the preservation-use spectrum (Text Table 3) as represented by allomemes 1 and 3 - at A, against the extreme idealist position that values nature above social justice; at C, against the extreme commercialist position that values the free-market above conservation; and at B, for greater investment in environmental protection and social justice together. See text for explanation.

meeting of the Business Roundtable. The figure is highly speculative and serves only to illustrate a few general propositions, for example:

1. the optimum cultural fitness of the commercialist view and the probable optimum genetic fitness of the associated phenotypes do not coincide – in other words, this allomeme is another case of gene-cultural opposition, a maladaptive process that cannot last for long;
2. the shapes of the actual curve for cultural fitness of current Anglican views and of the genetic fitness curve roughly match, and
3. the best contribution Anglicans could make would be to argue for change in the directions necessary (shown by arrows on Fig 5b) to promote the allomeme(s) that most closely matches the expected genetic fitness function for our society.

In other words, Fig 5b suggests a programme for the Fifth Mission Statement.

12 ACTING ON THE FIFTH MISSION STATEMENT

If the Anglican community in New Zealand is serious about the Fifth Mission Statement, and if all the foregoing material is more than just an academic exercise, it ought to lead to a programme for action. Here are some suggestions of things that we could consider doing, or accelerating, as soon as possible.

12.1 Redouble and publicise our effort to rethink the relationship between Anglican creation theology and the natural world

If Anglican theology is to be believable to the unchurched people (the vast majority) of the twenty-first century, if it is to convey to them the unconditional love and grace of God, and to make a real contribution to combating the environmental crisis, it cannot avoid the arduous task of re-examining the content of Christian theology, especially that relating to creation. And it must do so in association with, and with specific attention to, the new knowledge derivable from the contemporary sciences, since both enterprises purport to be dealing with what they regard as dynamic realities (Peacocke 1993: 6).

The job will be far from easy, and will be convincing only if it involves extensive consultations between theologians and scientists at all levels, right across the broad spectrum of Anglican opinion. That is a very tall order, as is illustrated by the problems summarised in Section 2.2. The aim of such a programme would definitely *not* be a matter of “making the Church relevant to the modern world” in the sociological sense. There is no single “modern world” to address. The paradox of any kind of modernisation programme, of liturgy, music, ordination rules or the underlying theology itself, is that for every one person for whom the gospel is thereby made “relevant” there will be someone else for whom it is made irrelevant (McGrath 1993:121). Rather, it is a matter of insisting on an *engagement* with the intellectual currents that surround us: to gain a hearing for our faith in modern culture by addressing our concerns in terms that can be widely understood, and vice versa. Our theology needs to be shaped by pre-existing realities, including biology (S1.6). In the

present context, that means taking into account *both* the secular realities *and* the theological traditions, as illustrated in Fig 2.

The process of rethinking ancient doctrines is very scary for ordinary believers. The conflict model (S.1.5.1), though discredited by influential theologians such as Barbour and Peacocke, remains very strong, which helps to explain why so many people reject the very idea of revising the formulas in which ancient certainties have so long been expressed. The main thing to be said in support of it is that it leads to growth and vigour, as when a hermit crab sheds an old shell and moves into a new one of a different shape (Fig 1), whereas the only alternative is constriction and decay. The pre-requisites for growth and vigour are faith, confidence and a clear grasp of the metaphorical nature of both religious and scientific truth (S.1.6). These are a lot to ask, and the danger is less of getting it wrong than of excluding many people of simple faith from the process.

The average pew-sitter is generally unaware of what limited rethinking is already in progress, because, regrettably, there is a massive gap between the perceptions of Christian truth as found in theological colleges and as believed among ordinary people. It seems that the gap has arisen because of an unhealthily distant relationship between the colleges and the people (McGrath 1993:156). So,

‘theology’ is frequently regarded as the activity of intellectuals of doubtful Christian commitment...isolated from the realities and tensions of the religious experience of ‘ordinary’ believers living in the ‘real world’ (Peacocke 1993:10).

But I believe that the study of Christian truth is ideally not an academic search for some objective, pre-existing nugget of universal validity to be conducted in ivory towers and then triumphantly announced to the ignorant, but a shared struggle to make sense of our communal experience of the divine in an uncaring world. So the rethinking process we need now must be much more of a two-way affair than it has been hitherto. If theology in the twenty-first century is to be resurrected from academic irrelevance, it will have to be much more open to reasonable input from ordinary Church members.

The main problem of any tinkering with creation theology is that it is so fundamental. Changes in one proposition of an interlocking set have cascading consequences for

many others. Kaiser (1996:281) gives a historic example of the problems for Biblical faith that were raised by the adoption of Aristotelian cosmology into theology by Aquinas in the thirteenth century. Aristotle, a pagan philosopher who had none of the delight in God's creation of wild nature visible in the writings of Augustine (Santmire 1985: 60), regarded the earth as a place of change and corruption, since it was so far from the incorruptible heavens. Christians who wished to accept the cosmology of Aristotle as current science, but not to deny the Genesis account of the goodness of creation, could only credit the natural mutability and corruption on earth to the effects of the Fall, rather than to the design of creation itself (Kaiser 1996:281). This in turn further promoted the false and illogical idea that the natural world was somehow also corrupted by Adam's sin - even though all the major theologians of the patristic and scholastic traditions (Athanasius, Basil, Augustine and Aquinas) agreed that the order of wild nature was beyond human meddling, had never disobeyed God and was not affected by Adam's fall (Kaiser 1996, van Till 1996). Biotheology certainly confirms their view, for the different reason that, by the time humanity arrived on the scene, the non-human world had had the earth to itself for >99% of global history.

This process of fitting the new into the constraints of the pre-existent is common in nature (Gould 1983a, Williams 1996) and in the Bible. The episode of Peter at the house of Cornelius (Acts 10) was one the earliest of a long series of fundamental challenges for the early apostles raised by the need to adapt to the new understanding of God posed by the ministry of Jesus. Hence I emphasise (1) the *continuation* of this effort rather than the beginning of it, and (2) the social context of the assumptions surrounding it. Yet, even though reformulation of doctrine is a long and time-honoured process, the results may seem incomprehensible when they trickle down to parish level. If we cannot put new information into context, or estimate its potential significance, we tend to ignore it, just as the first Aboriginals to see a European sailing ship ignored it (Willey 1979).

I recommend that any serious attempt to implement the Fifth Mission Statement must incorporate at least the following three key concepts.

1. Nature is dynamic, therefore the static Biblical view of a natural world whose structure and boundaries are directly controlled by God must be actively repudiated, and clearly distinguished from the associated theological ideas of the constancy and power of God. It is no longer appropriate to think, even metaphorically, of mountains as eternal and the limits of the sea as fixed.

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2. Humans are part of nature as well as separate from it. It is no longer appropriate to think of humans as a special creation, which means that the evolutionary roots of our attitudes and behaviour have to be taken into account when attempting to meet the Biblical demand that humans must take responsibility for their use of the natural world. For example, tribalism is an ingrained and destructive aspect of human nature which obstructs the Fifth Mission Statement more than almost anything else; to overcome it, we need to understand its biological roots as well as learn from the Biblical description of how an intensely tribal people eventually developed a universal faith.

3. The beginnings of morality can be seen among sentient, sociable animals, but always with strings attached; in humans grace can go further, and perfect nature. It is no longer appropriate to think of humans as having fallen from some original state of perfection; guilt is personal only, not transmitted, and is already fully forgiven through Christ. Christians able to take non-judgemental delight in the earth as God does, and to enter into the true liberation of their redemption, can be energised to work for the Fifth Mission Statement, whereas those unwilling to leave off keeping scores merely stand in the way.

It may be objected that the contemporary generation has no right to modify historic doctrines in this way; but, on the contrary, I would argue that we are failing in our duty to love God with all our minds if we refuse to make our understanding of historic truth relevant to the world we actually live in. Of course that will mean modifications, but that happens to scientific ideals too. As the ecologist Charles Elton pointed out, conservation of nature in the intensely humanised parts of lowland England “means looking for some wise principle of co-existence between man and nature, even if it has to be a modified kind of man and a modified kind of nature” (Elton 1958:145). Modification of these vital doctrines is a lot better than seeing them abandoned as irrelevant.

12.2 Develop new metaphors and sacred stories

The huge literature on myths and sacred stories is reviewed by Campbell (1970), Doty (1986) and Rue (1989). They, like most other forms of knowledge including those dealt with by both science and theology, are basically metaphorical.

The metaphors of theological models that explicate religious experiences can refer to and can depict reality without at the same time being naively and

unrevisably descriptive, and they share this character with scientific models of the natural world (Peacocke 1993: 15).

Metaphors can be changed without damage to the truth underlying them, and in fact metaphors that no longer convey that truth *must* be changed if the truth is not to be lost. Hence, the process of rethinking doctrine can proceed by first identifying an outmoded metaphor that is no longer helpful in a scientific age, defining the underlying truth, and then suggesting an alternative metaphor that more clearly conveys that underlying truth to the contemporary mind.

An obvious example for a biologist is the doctrine of the Fall. Christians cannot continue to assert that early humanity ever lived in a state of perfection from which it has fallen, and yet the basic insights of the Eden story, that there is something in human nature that makes sin easier than virtue, and that disease, decay, pain and death seem incompatible with what a loving God might have planned for the world, are as true and relevant as they ever were. The contribution of modern biology towards explaining these ancient insights is explored in Appendix 3, and, in much greater detail from the theologian's perspective, by Hefner (1993).

Christian doctrines have developed down the ages by a cumulative, adaptive, interpretive process not unlike that used by science (Barbour 1997:115, 133, Murphy 1990). So long as there is a commitment to a basic core of belief, other issues can be explored and modified without distraction. Just as Job questioned his fate and debated it with his friends without endangering his faith in God; so we must take seriously and explore the implications of biological insights into sin - and in a form easily grasped by non-biologists.

For example, understanding the "odds against altruism" (Grant 1993) is important to the Fifth Mission Statement, since, in the large, scattered societies of today, exhortations and institutions "built on the assumption that people are selfless altruists are likely to fail" (Daly and Cobb 1990:140). Biotheology can work with others on one of the most urgent tasks ahead, the formulation of new metaphors true to these abstract concepts and still capable of carrying all the vivid immediacy of the Eden story . One possibility is suggested by Michaelson (1994: 104). The traditional interpretation of the Eden myth is that Adam's sin introduced death and decay into the world. But any organic gardener knows that life comes out of death. This is not a modern insight - at the height of the dispute with Augustine, Justin argued that human

12: Acting on the Fifth Mission Statement

death is a mercy, not a punishment (Pagels 1988: 142). Death and decay are therefore to be understood as part of the goodness of creation declared in Genesis. A less likely possibility that might appeal to people with a knowledge of genetics might be to construct an image of Eve's daughters as the healers of the mutations of Adam's sons (Appendix 3.8). Meanwhile, committed Anglicans continue to make the mental translations required to listen to beloved ancient liturgies, but have difficulties in explaining their multiple illogicalities to outsiders.

Rue (1989) has pointed out that we humans are wise only to the extent that we perceive *both* what is true and *also* what is sacred. The Eden myth, like all historical wisdom traditions, once offered an integrated vision of how things are (facts) and which things matter (values). Popular Christianity has held onto this tradition despite the challenge of science, unwisely attempting to preserve elements of a bygone science and coupling a vision of the sacred to an antiquated vision of the truth. Western culture, Rue claims, has thereby "lost something fundamental to the achievement of collective coherence and individual wholeness: it has lost a shared orientation in nature and in history". This is as true in New Zealand as it is elsewhere.

To help restore that lost vision, Peacocke (1993) has provided a comprehensive integration of the scientific account of the origins of the universe with a modern theology of creation and redemption. Other theologians have presented variants of basically the same scheme from different points of view. The common creation story, as McFague (1993: 104-9) calls it, urges us to think differently about the earth, to know that we are profoundly connected with all other forms of life, not in a romantic but in a realistic way, and that together we need to learn to live responsibly and appropriately in our common home. For the theologian Thomas Berry (1988:123-37) and his collaborator the physicist Brian Swimme (Swimme and Berry 1990) this new story of the emergence of our earth must become the norm of reality and the central value for every other activity. It need not be perceived as a threat to religious traditions, including the Biblical one (although it will be seen as such by many), because those ancient traditions can all find their meaning within the context of the larger story they share with scientists.

For example, Rasmussen (1996:324) points out that many venerable spiritual insights are fully consistent with ecology, such as "all that exists, co-exists;.....creation is a community;...[old religions had] a sacramental reservation about messing with natural systems". Spretnak (1986) reckons that the four main

goals of green politics (inner growth, ecological awareness, gender equality and social responsibility) are already embedded in many religious traditions, although needing to be rediscovered in some. Swimme and Berry's point is that a universal science-based sacred story might allow the disparate members of the global community to set aside their conflicting traditions and unite in the face of the oncoming environmental crisis.

Rue (1989) agrees that evolution is the best new root metaphor for the activity of God, a compelling manifestation of transcendence. It can integrate cosmology and morality in terms acceptable for our times, because the wider meaning of evolution encompasses all aspects of creation, not the merely biological. Rue concedes that philosophers, theologians and scientists will all object that although evolution may be able to show us *how* historical processes produced the human life form, it has nothing to say about *why* we should behave in ways that should enhance and preserve life, except by adding a moral assumption that life is good. That assumption is no part of evolutionary theory; it is a value asserted by faith or by authority (Rue 1989:177). Nevertheless, he insists, a universally shared respect for evolution as a common creation story could inspire very many of the intelligent, informed and moral people who have been estranged from their cultural tradition by its attachment to implausible conventions. He sees them as taking the metaphor of evolution into a new form of the ancient Covenant, and re-entering the churches with it in order to start a movement towards a reunification of western culture and the restoration of personal wholeness and social coherence (ibid.:178-9).

In a multicultural society, eg the US or New Zealand, such a proposition might not find wide acceptance. There would be great variation in cultural perception of the idea of evolution as a story of cultural origins, and profound difficulty in making the transition from a story involving recognisable characters acting in time to an impersonal history of gradual transitions. But the fact remains: we need to find some culturally acceptable way to account for the xenophobic default setting of human nature which ensures that all idealistic environmental management programmes have to have some provision for "mutual coercion, mutually agreed" (Hardin 1968). We need some way to handle the old, old problem of the Prisoner's Dilemma: the savings made by those who choose to believe that "rational frugality can save the earth" (Athanasίου 1996) can always be used up by those who don't give a stuff - even, as Berk's Law demonstrates, if it is widely known what the consequences would be if society allows them to get away with it (S.5.2.2). Chief among those consequences would be, of course, the total failure of the Fifth Mission Statement.

12.3 Sponsor Religion and Science education programmes in parishes, schools and universities

One of the most important challenges to the churches now, one which “they have failed to face in any significant way thus far” (McDonagh 1994:111) is to educate people about the magnitude of the crisis and the urgency with which it must be faced. There is very little evidence of constructive leadership on this matter even in Church schools, never mind at parish level. On the contrary,

In the face of uncertainty, represented to us by, among other things, the environmental crisis, the normal reaction is to retreat into what is known and secure. But this cannot be enough because it is those very areas that are supposed to be known and secure, science, our religious traditions, our own public selves, that have led us into this position and are now brought into question. Where do we go from here and how can we move forward when these familiar thought patterns no longer warrant our uncritical trust? (John Reader, in Ball et al. 1992).

Some religious *traditions* may not be helpful now, but it is part of the Christian’s fundamental outlook that *God* is always worthy of trust, so long as we are also willing to open ourselves to God’s leadership and take what responsibility we can for our own choices. Now more than ever, we need to use our God-given powers of reason to help ourselves, and to remember Cromwell’s admonition to his troops: “Trust in God, and keep your powder dry”. That means obeying the Great Commandment to love God with all our heart, soul, strength *and mind* - and applying to the things of God the same critical intelligence and modern knowledge we apply to the most serious of our own concerns. Yet, to the despair of forward-thinking Christians like Sean McDonagh (1994: 108), the latest version of the Roman Catholic catechism still teaches converts to believe that “man is at the summit of the Creator’s work” and that “animals, like plants and inanimate beings, are by nature destined for the common good⁵⁰ of past, present and future humanity”. The only criticism of this

⁵⁰ In this controversial document on the Roman Catholic Church’s social teaching, “the common good” was defined as the concept that “society ought to be organised....to improve the lot of all its members” (Anon 1996). It is one of very few Christian documents I have seen

antiquated statement that was voiced at the time of publication concerned its sexist language, as if that was more significant than its content.

Anglicans generally are not well instructed in the doctrinal foundations of their own faith, of which the most relevant here is the theology of creation. Many would be surprised to hear that modern Christian theology is intellectually respectable and entirely compatible with science (S.8.3). Existing education programmes such as EFM* help lay people to appreciate the history of existing doctrines; people who have been through EFM or a similar programme can become less defensive about objective definitions of truth and more familiar with the idea of metaphorical truth. Both prepare people to think about, and participate in formulating, new doctrines. For example, the biotheological perspective on reproduction suggests that sex education might put more emphasis on the dynamics of the global population explosion. This might seem contrary to one of God's earliest commandments, which urged us to be fruitful and multiply – the only commandment that we can claim to have fulfilled, says Cavanaugh (1996:278). So our modern task is to harmonise that commandment with responsibility for stewardship of the earth's resources.

The 300-year historical separation of religion and science has had the effect of trivialising both traditions. Religionists caught up in supernatural dogma become indifferent to the earth⁵¹: scientists caught up in naturalistic dogma remain blind to the spiritual aspects of creation, say Berry (1988) and Oelschlaeger (1994). So there is an intense need for education programmes for church schools and parishes that combine religion and science, and de-emphasise damaging older doctrines such as exclusivism. There are a number of existing possibilities that the Church could join or adapt.

In 1994 the John Templeton Foundation's Course Award programme began to offer 100 prizes a year of US\$10,000 each to set up courses joining religion and science in tertiary institutions. This programme has been hugely successful in stimulating

which acknowledges that "the environment is one of the 'common goods' which are the shared responsibility of the human race" but only for purely instrumentalist reasons, and without explaining why the management of common goods is difficult (S5).

⁵¹ and, I would add, to the simple pleasures of being human; Roman Catholic dogma claiming that sex is merely a device for procreation has thereby denied the enormous importance of sex as part of the mechanism of the pair-bond between couples, and ruined many a loving marriage.

teachers and students around the world to think seriously about many of the issues discussed in this thesis. A course entitled *Science and Spirituality*, proposed by a multidisciplinary team coordinated by me, won a Templeton Award in the current round (1998). The course will be offered at Waikato University in July 1999, and its outline is already mounted on the World Wide Web (www.templeton.org).

The Templeton scheme is deliberately limited in two respects. First, each award is regarded only as “seed money”, available for the first year only - after that, the courses are supposed to be funded by the host institution. Second, the awards are available only for courses run for full academic credit at approved tertiary institutions, so continuing education departments, schools and home study groups cannot apply for funding. But there seems no obvious reason why some appropriate Anglican authority could not adapt the idea of sponsoring courses for use at parish or school level.

The Church could explore the possibility of becoming a corporate member of one or more of the various overseas organisations that encourage liason between science and religion, listed in Appendix 4. All produce journals and/or newsletters or run Web sites that would provide information to New Zealand Christians getting involved in the field, and some are specifically focussed on environmental matters - e.g., the John Ray Initiative (run by CiS), dedicated “to promoting responsible stewardship in accordance with Christian principles and the wise use of science and technology”. The UN-sponsored programme *Caring for the Earth* produces a useful Learners Guide full of information and group exercises (UNEP 1992), and encourages free copying of it for educational purposes (<http://coombs.anu.edu.au/~vern/caring/care-earth1.txt>).

12.4 Recover the Biblical understanding of religion as an active involvement in politics and the environmental debate

Until the mid to late 1960s New Zealanders, surrounded by clean air and green pastures and bush, had few worries about their environment. Then the accelerating row over the proposal to raise the level of Lake Manapouri captured public attention as no environmental matters had ever done before. Having learned, to its surprise, that a well-organised campaign backed by very strong convictions can force a change

in government policy, the newly-minted environmental movement became “a force to be reckoned with” (Taylor and Smith 1997), for example in disputes over the logging of native timber, the Clyde dam, nuclear ships and many other issues through the 1970s. Roger Wilson summarises the history of these and other grass-roots campaigns of that era (Wilson 1982).

At the other end of the scale of political clout, much has also been done. To quote only two authors; Palmer (1990) describes the various government-level initiatives he worked on as Labour Minister for the Environment from 1987 to 1990, including among other things the international bans on whaling and drift-net fishing, ratification of the Montreal Protocol, and the massive Resource Management Law Reform Project. His later book (Palmer 1995) added a telling commentary on Rio. Rainbow (1993) provides a less partisan survey of the history of green politics in New Zealand. So I most emphatically do *not* wish to under-rate the extent to which New Zealanders are already actively involved in the politics of the national and international environmental debate. My point is merely that these were all *secular* initiatives: the Church was practically silent on these issues, being pre-occupied with its own internal concerns, and most Christians who got involved⁵² did so as citizens of the state. This has indeed been a problem for the Fifth Mission Statement, since the most concerned parishioners who might have soonest rallied to it were already doing what they could with secular organisations (J. Richmond, pers.comm).

It would be easy to conclude, as many non-Christians would, that there is no need for any specifically Christian input in addition to all this, and no environmental issue on which Christian leadership would be in any way more credible or effective than that of the existing secular organisations. On the other hand, religion can be an effective source of moral criticism of and resistance to the state, especially a modern state whose over-riding purpose is to facilitate industrial growth (Oelschlaeger 1994: 80). Issues which span the borderline between environmental protection and social justice - the indistinguishable overlap zone between the Fourth and Fifth Mission Statements - touch the Christian conscience more than most, and demand a Christian response. I suggest two possibilities, one overseas and one at home.

⁵² According to a recent survey, some 70% of the members of the German green party describe themselves as religious, even though most are critical of the official churches (Galvin and Kearns 1989:55).

12.4.1 Overseas

On the global scale, one of the problems most relevant to the Fifth Mission Statement is that of international debt. The spectacle of the poor bankrupting their societies and natural resources to pay the rich, described in S.4, is grossly offensive to any definition of civilisation, and it is obvious to anyone except the owners of the debts that it must stop. Even more offensive is the fact that the debts have themselves become a tradable commodity. Financial traders can buy a debt at a discount and then make a killing as it increases: the value of the Venezuelan debt, for example, rose 48% between March and July of 1989 (McDonagh 1990: 27). Yet the Southern countries can do absolutely nothing to help themselves: the rules are rigidly imposed by the Northern countries, which have not so far gathered the will to relax them even though their effect is to finance the destruction of the biosphere on which they also depend.

Anglicans are already represented at high-level consultations on this issue, such as the one hosted in 1996 by the Anglican Communion Office at the UN (Itty 1996), and the "Dialogue on World Faiths and Development" hosted in February 1998 by the Archbishop of Canterbury at Lambeth Palace (see World Bank press statement on www.worldbank.org). In 1998, both the Lambeth Conference in London and General Synod in New Zealand supported the Jubilee 2000 campaign, which urges the World Bank and IMF to recognise the social consequences of their policies, and consider the idea that the Southern debt could simply be cancelled. That would not be as impossible as it sounds, so long as it is done soon. In late 1993, the debt burden of the lowest-income, most severely indebted and most desperate countries (those with a per capita GDP of <\$675) stood at about \$25 billion. At that time, this amounted to about half the capital reserves of the World Bank and the IMF, which then added up to \$52 billion (McDonagh 1994: 81,77). If it would have taken only half their reserves to completely write off the existing debt then (but presumably much more now), without endangering the credit-worthiness of either institution or their future funding operations, surely Christians have to ask, why this has not been done already?

There are two powerful reasons for promoting the idea of debt cancellation.

1. Contrary to intuition, it is in fact a very good idea from the *Northern* side of the equation. As Ambler (1990:13) points out, clearing the international financial

system of immovable debts would be an act of self-interested generosity by the North that would very soon pay off, in improved international relations and rescued wildlife, and as a means of drawing the Southern countries into international decision making. The alternative is starkly different: if the debts are not written off or rescheduled, investors may with-hold further support or debtors may default, both of which could have catastrophic consequences - including a possible crisis in world banking, and/or increased piracy and terrorism from the South.

2. There is a solid Biblical basis for the idea, in the concept of the year of grace, when the extra land that had been acquired by the rich and powerful was to be returned to its original owners (Lev.25:23-31). The command even extended to the remission of short-term personal debts (Deut. 15:1-2) - pledges taken as security for small loans had to be returned by nightfall (Ex 22:26-27). The Hebrews understood their God to be one concerned with justice, a God who was capable of punishing a nation in which a few lived in abundance and all the rest in misery (Deut 15:4-11). So the point of these regulations was to minimise the inequity between rich and poor in order to make Israel a genuine community united in the service of Yahweh. Catholic bishops from the South use this argument in appealing to the North for debt cancellations, but, to nobody's surprise, they have not yet had much success. The Jubilee 2000 campaign is based on the same concept, and could have more effect because it involves people from the *North*, not the potential beneficiaries.

On the other hand, there are some genuine arguments against simple debt cancellation, some of them summarised by the economist Susan George in her study of the problem, *A Fate Worse than Debt* (George 1988). She does not recommend outright debt cancellation, because it benefits those corrupt Southern elites who have made their own substantial contribution to the problem by mismanagement and embezzlement (the regime of President Marcos was only the most obvious one). Noam Chomsky (1998), a persistent and influential critic of first-world economic imperialism, agrees: third world debt is the responsibility of corrupt Southern leaders, not the people who are now being asked to bankrupt themselves in order to pay them off.

George advocates a better idea: redirecting debt payments to supporting both genuinely democratic and sensitive development agencies, and also the so-called "debt-for-nature swaps".

In a "debt-for-nature swap", an idea proposed by Thomas Lovejoy and initiated by the World Wide Fund for Nature in 1984, Northern conservation organisations arrange to

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purchase a chunk of Southern debt (usually at a substantial discount), in exchange for guarantees of protection for important natural areas (Korfhage 1990, Resor 1997). The idea works only when the owners of the debt, commercial banks or governments in the North, are willing to accept a lesser payment plus a negotiated tax writeoff as preferable to the likely alternative, a future total loss. But when it works, it produces significant resources for conservation that would not otherwise be available. By the date of Resor's analysis, about \$180 million in foreign commercial debt had been purchased at 26% of face value, which had generated the equivalent of \$130 million in funds for conservation. There are also direct government-to-government debt-forgiveness programmes, which reduce payments schedules and release funding for conservation initiatives. In 1991-93, the US forgave 53.8% of \$1626.3 million of debt owed by seven Latin American countries, releasing \$154 million in funding for conservation and child survival programmes over the next ten years. The amounts involved are small next to the total indebtedness of the South, which exceeds \$1 trillion, but they have already provided the key starting point for the development of new approaches to long-term financing for conservation - especially those that have been converted into perpetual endowments and trust funds.

There are, as always, problems (McDonagh 1990:28). Sometimes the money intended to pay off debt ends up in the wrong pockets, or is invested in areas where logging is still promoted, or decisions are made without consulting the wishes of the indigenous people. Critics of the debt-for-nature swap idea say it is merely a new form of paternalistic colonialism. Why should Northern people, who have already destroyed their own environments, lecture the South about how to preserve theirs from the destruction which is, incidentally, largely due to economic policies driven by the North? There is a double bind here: the need for environmental rehabilitation in most tropical countries is enormous, yet debt-for-nature swaps seem likely to be able to operate only on a relatively modest scale – in part because governments of developing nations are extremely sensitive to doing anything resembling “selling out to foreigners”. That fear is un-necessary, because the donor organisation always converts the funds to local bonds in the hands of a local conservation organisation. On the other hand, that in itself can cause difficulties within local organisations unused to handling large amounts of new money (Korfhage 1990).

The international community has successfully modified the original idea in the face of these and other criticisms, and developed a new way of thinking about conservation in the South (Resor 1997). Various forms of investment in debt relief and

environmental protection remain among the very best long-term financial strategies that Northern governments and multilateral funding agencies could pursue into the twenty-first century. The Church could help by bringing the debt crisis and its potential solutions to the attention of Northern peoples, whose governments will not see it as an issue to be taken seriously until their own people perceive the injustice - and the long-term threat to themselves - and press for action. Considering that the Biblical tradition so strongly condemns the very practices and consequences that are so widespread in the South today (McDonagh 1994), and the liberating experience of God's forgiveness which is part of the central creed and personal experience of Christians, the failure of the Northern provinces of the Church to make a huge public issue of Southern debt might seem extraordinary - until one remembers the limitations on human compassion set by our xenophobic past (S.6.7).

12.4.2 At home

If the New Zealand Anglican Church seriously wishes to demonstrate its potential for civic leadership and concern for the earth community, as expressed in the Fifth Mission Statement, the single, largest, most immediate *practical* way that it could do that on its own ground would be to initiate the formation of a local version of the Real World Coalition (RWC).

The 40 members of this London-based organisation represent all kinds of social and environmental concerns, of which some are active only in UK and some (e.g. Christian Aid, Friends of the Earth, Oxfam, Transport 200, Unemployment Unit, Worldwide Fund for Nature) have branches or close kindred in New Zealand. They got together because they recognise that the issues with which they are each concerned are all related, so the particular concerns of each individual organisation cannot be addressed adequately unless they all are. RWC seeks to get all the separate issues onto the political agenda, and furthermore, to press for a coherent political and social programme working towards the goals of sustainability, social justice, democratic renewal and community regeneration.

The different member bodies of RWC all recognise the strong connections between environmental organisations and those concerned principally with social justice (a long-obvious link which American humourists, knowing the joke value of anti-communist red-baiting, used to use in order to denigrate environmental campaigners as "just watermelons - green on the outside and red on the inside" or "tomatoes, who start off green and turn red" : Athanasiou (1996:17, 162). Certainly RWC is a clear

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illustration of the oft-repeated point that the Fourth and Fifth Mission Statements are inseparable, both in practice and in principle. By 1996, RWC had been in existence for less than two years, and claimed 2.1 million members, all ordinary people committed to change and prepared to support their beliefs financially and through various kinds of non-party political activity (Jacobs 1996:4). In future years RWC could become an influential critic of capitalist economics, and its activities might help strengthen the chances of forcing the modifications to it, urgently needed to mitigate both social stress and the environmental crisis.

The Anglican Church could take the initiative in setting up a similar organisation in New Zealand. Obviously, such a proposal would have to gain approval from General Synod – it has already been approved by RWC - and if that were given, the next steps would be to establish some sort of communications centre, and approach all likely interested organisations in New Zealand. RWC's advice is that we should build the liasons first, and go public later. Within a few years it ought to be possible to produce a New Zealand edition of *The Politics of the Real World*, and to use it to promote public discussion and educational programmes on social and environmental issues. The different members of the group would still be free to take their own perspectives on the questions raised, but they can also learn from each other. That means that Anglicans can concentrate on the theological dimensions of any particular issue within their own educational groups, but would have the benefit of co-operation with other members to increase the impact of lobbying for political change, perhaps in the directions suggested by Fig 5. The history and effects of the Hikoi of Hope – an independent, indigenous version of the RWC concept – should give us a fair idea of the future potential for Anglican leadership and lobbying for change.

Those who still believe that politics and religion should be kept separate should listen to Archbishop Tutu, or read Alistair Kee's chilling account of Constantine's political takeover of the early church, which opens with the words: "The view that politics and religion should be kept entirely separate from one another is a relatively recent one in history" (Kee 1982:1). On the contrary, controlling

an ecologically destructive use of technology requires ethical and political decisions.... and political answers by their very nature involve conflicts of interest and the play of power rather than the dispassionate workings of scientific reason (Shinn 1972).

Daly (1990: 355) list three steps towards redirecting the courses of Northern economies for the sake of the future of humanity and of the whole biosphere, all of which would be better promoted by a co-operative like RWC than by any independent lobby group.

First, recognise that the facts documenting the impacts of our present free-market policies on environmental values and human welfare must be taken seriously. This first step has already been taken by the members of the green activist groups and readers of the environmental literature, but not to any great extent by the public in general or by non-green politicians. There is widespread uneasiness about what appear to be numerous separate problems, perhaps especially because attempts to deal with them separately tend to have limited success.

The second step is to recognise that all these problems are interconnected and all are due to the same cause, the single-minded, global application of free-market economics. Once this step is taken, events become intelligible and human responsibility becomes clear. This is the bit that would be most difficult in New Zealand, wedded as it is to the ideology of free trade, itself a key both to free-market economics and to the damaging consequences for society and nature (Daly and Cobb 1990:209). In recent years, public awareness of the ideological roots of the problem and its consequences for the general population has been growing steadily.

The third step is to realise that, for the moment, we still have the option of choosing a liveable future for ourselves and our descendants. The obstacles are still formidable, but Daly and Cobb see signs of networking between visionary groups (feminists, environmentalists, indigenous peoples, many religions) that spread ideas and offer the hope of growing into a cultural movement that could change public perceptions in the near future. It will certainly take such a change to get enough people to see that "the debt to nature cannot be paid person-by-person in recycled bottles....but in the ancient coin of social justice" (Rasmussen 1996:142, quoting from Barry Commoner). RWC is therefore largely a political organisation, and for good reason: as Athanasiou (1996:50) asserts, nature cannot be saved unless we first save democracy.

RWC's counterpart in the business world is The Natural Step (TNS), a non-profit environmental education organization working to build an ecologically and economically sustainable society by influencing business policy independent of politics. TNS offers science-based instruction on sustainability to businesses, communities, academia, government entities and individuals trying to redesign their

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activities to become more sustainable⁵³. It is based on systems thinking, focusing on first-order principles at the beginning of cause-effect relationships. It recognises that what happens in one part of a system affects every other part, often in unexpected ways.

Paul Hawken (1993) was probably the first to see that, over the long term at least, it could be possible to reform the world of business in a way that not only appeals to the survival instincts of businesses, but also allows for the natural human tendency of their customers to look for a good deal. His vision involves the complete redesign of the business environment, the deliberate rethinking all traditional and currently accepted commercial management practices, in order to create profitable, expandable companies that do not destroy the resources they use or the world they operate in. It would involve intelligent production systems whereby companies sell, not their products but a temporary right to use them; it could virtually eliminate toxic waste; it could reduce unemployment and make conservation of nature and raw materials by labour-intensive methods not only necessary but *also highly profitable*. The main message of Hawken's book *The Ecology of Commerce* (1993) is that enlightened business will in future not oppose such a massive change – rather, it is a reasonable agent for it, indeed the only mechanism powerful enough to reverse global and social degradation.

The Natural Step was founded in Sweden in 1989 by Dr. Karl-Henrik Robèrt, an oncologist who noticed a significant increase in cases of childhood leukemia, and witnessed first hand the connection between human illness and environmental toxins. He became concerned that so much of the environmental debate was focused on downstream issues and so little on systemic causes of problems. With the help of 50 Swedish scientists, Dr. Robèrt developed a consensus document that describes key basic knowledge of the biosphere's functions, including how society influences natural systems; that humans are a part of natural systems; that humans are threatening themselves by deteriorating natural functions; and, finally, that there are great possibilities to change the situation into an attractive sustainable society.

The TNS framework helps individuals and organisations address key environmental issues from a systems perspective, reduce the use of natural resources, develop new technologies, and facilitate better communications among employees and members. In Sweden, TNS has been transforming the way individuals, schools, communities

⁵³ See the TNS website at www.naturalstep.org

and businesses think about the natural world and about sustainability. More than 70 Swedish municipalities have adopted the framework, and 60 corporations such as Electrolux, McDonalds, Scandic Hotels and OK Petroleum are actively using TNS to change the way they do business. TNS now has offices in UK, US, Canada, Japan, Australia, and New Zealand.

TNS supports the view that the contemporary world is like a giant funnel. Societal demand for resources define one wall of the funnel, and resource availability the other side. As aggregate societal demand increases, and the capacity to meet those demands decreases, the space between the walls of the funnel diminishes and the options available to business become narrower. In the near future, fundamental changes in perception of what counts as sound business practice will be necessary. Only the companies which adopt strategic policies appropriate to this new business environment, and make investment decisions that will provide long-term benefits in the very different world of the future, will survive.

Making the changes required will not be easy at first, because companies that ignore their social responsibilities may be more profitable in the short term. As in all such situations involving competition with others, they know they can do well by being good - but they can do even better by being bad (Text Table 4). But to me it seems that the future business world may well be analagous to Axelrod's computer tournament. The programme Tit-for-Tat won because it was co-operative and not too greedy. It survived long after the more aggressive programmes had eliminated each other.

Beneficial changes in the business world could also be driven by discriminating investors favouring the growth of ethical investment strategies. Ethical investment funds are still small by comparison with ordinary ones, but are at least as profitable and growing far more rapidly than the average mainstream portfolios (Nicholson-Lord 1998). Their managers refuse to invest in companies dealing in, for example, arms, tobacco or socially exploitative products, and their business is likely to grow as pressures for environmental regulation increase⁵⁴. Studies in UK have shown that individual ethical investors can be active and effective in using their savings as tools to persuade companies to behave better – and the British Government, now reviewing company law, is also listening.

⁵⁴ The European Union has produced an average of one new item of environmental legislation every 2 weeks for the last 10 years (Nicholson-Lord 1998).

Businesses and politicians are sensitive to shifts in the attitudes of the general population, and in the long run they have to follow rather than lead those shifts (Oelschlaeger 1994). The Anglican Church is a large organisation, and it not only controls substantial investments and trust funds of its own but also has the opportunity to educate the investment decisions of its members in the light of the Fourth and Fifth Mission Statements. If the Church investigated the security of these funds, and, if satisfied of the wisdom and responsibility of doing so, then took a decision to set an example by placing its own funds only in ethical portfolios, and encouraged its members to do the same, it would be making a practical contribution to changing many of the damaging trends in international business summarised in S.4. Like TNS, ethical investments work because they harness the natural combination of self-interest and social concern found to various degrees in most people and businesses - even in chimpanzees (S. 6.2.1). The aggregate effect could be substantial.

Fig 2 shows that the Fifth Mission Statement must operate in the biological, political and economic worlds as well as the more familiar ecclesiastical world. Biology and game theory explain why well-intentioned exhortations never work; politics and economics explain the dominant forces that have to be redirected if humanity is to have any chance of meeting the Worldwatch Institute's deadline (S.1.1). If the Anglican Church in Aotearoa New Zealand is willing to harness its considerable resources and co-ordinate its efforts towards an agreed, defined goal, it could play a leading role in the necessary economic and political reformations. If the principles of TNS and of ethical investment prove valid, and if then the Church adopted them as vehicles of its own considerable business affairs, and also initiated the formation of a New Zealand version of RWC, Anglican theology in this country could truly begin to answer Ambler's call to concentrate on its real job (S.1.2)

SUMMARY

The facts of the approaching global environmental crisis are widely agreed by secular researchers, and their general trends, at least, are not in dispute. Respected estimates give us between 40 and 70 years to reduce the total environmental impact of human activities, or face widespread disintegration of the natural and social worlds. Most environmental impact, and therefore most of the responsibility, lies with the wealthy industrialised countries of the North (including New Zealand). This thesis takes these facts as read, and considers how some of the possible interactions between biology and theology might help the Church make a contribution toward the contemporary environmental debate.

1. It is widely agreed that the appropriate action is necessary *now*, and secular activists have drawn attention to many important but curable environmental problems. But exhortations to modify the environmental impact of the unsustainable Northern way of life are generally met, either by token changes in a few superficial regulations that leave the underlying trends to continue as before, or are ignored altogether, largely because few Northerners are prepared voluntarily to reduce their standard of living.
2. The root problem is one of values, which implies that the churches ought to have a part in the discussion, but religious institutions have so far offer scant leadership because they are too often scientifically uninformed and distracted by internal issues. If they were doing their real job, they would be concentrating less on internal politics and more on the central problems of life, of which the global environmental crisis must rank as one of the most urgent.
3. It is possible to see a parallel between science understood as abstract speculation about the nature of matter, as distinct from technology defined as the practical management of life in the material world, and theology understood as abstract speculation about the nature of God, as distinct from religion defined as the practical management of life in the social and spiritual world. Under these definitions, this thesis is mainly about the *religious aspects* of the environmental crisis and about the *visionary faith* and *leadership* that the Church must find in order to face it.
4. There are also important distinctions between faith, religion and doctrine. Faith is personal and ultimately derived from the original apostolic *kerygma*, while religion

and doctrine are social, cultural, and intellectual and expressed in the mass of traditional *didache*. Religion and doctrine can be challenged and adapted in the light of secular knowledge without threatening faith, just as a hermit crab can grow a new exoskeleton and change its shell without affecting its personal identity.

5. Barbour's four-fold classification of the types of interaction between science (here, mainly biology) and religion provides a useful framework for interpreting the history of the Church's attitude to nature. I follow Barbour and Peacocke in advocating critical realism as an appropriate means of searching for ways of integrating their different insights into truth. The basic assumption of critical realism in both science and theology is that *existence precedes theorising*.
6. Over the last 15 years the JPIC programme of the WCC has begun to examine the issues raised by the environmental crisis, and has stimulated parallel studies in other churches. The Anglican Fifth Mission Statement (adopted in 1990) states that it is part of the mission of the Anglican Church to "to strive to safeguard the integrity of creation and sustain and renew the life of the earth". The Statement is already raising profound questions about many ancient traditional doctrines.
7. The affirmations of the 1990 JPIC World Convention in Seoul, and the various declarations made at Rio in 1992, have been widely debated and have stimulated much scholarly literature. But their impact on religious activities and attitudes so far has been small, despite the urgent need for action. Religion and philosophy have difficulties in explaining this apparent blindness, but biology and evolutionary psychology can suggest reasons which need to be taken into account.
8. The Christian doctrine of creation is derived from the Old Testament, in which the primary emphasis was on the continual dependence of all creatures on God rather than on the origin of life. God was understood to have established a single code of laws by which nature operated, which were in principle rational and understandable by humans because they share to some extent the rationality of God. There was a range of interpretations of the natural world, but they did not include *Creatio ex nihilo*, a late addition dating to about 200 BCE.
9. The three main themes of the historic creationist tradition, asserting that the universe reflects the goodness, rationality and freedom of God and therefore creation itself must be good, rational and contingent, were in due course incorporated within Christian faith and are entirely compatible with science.
10. For a relatively short period, from the 16th century until recently, science and religion have regarded each other as irrelevant, but their ancient compatibility is being rediscovered during contemporary adjustments to creation theology.

Acceptance and understanding of this compatibility is a keystone to the future success of the Fifth Mission Statement, and the related problem of combatting literalism.

11. Caring for creation is a recent concern for the Church, but is not to be dismissed as a ploy to bolster sagging congregations. Environmentalism is a recent concern for all other long-lived institutions too, and each one should bring to the debate its own particular insight. For Christians that includes the trinitarian belief, that a material life thought worth sharing in person by the Logos of God is thereby affirmed as worth our greatest care.
12. To the Hebrews, the concept of the integrity of creation referred to the fact that creation had never disobeyed God. Only the humanised parts of nature were affected by the Fall, and the hostile parts of it (thorns, thistles etc) were only conveying God's judgement on humans. The idea that Adam's sin corrupted the whole universe is a much later addition, incompatible with all Patristic traditions.
13. This Biblical idea of the integrity of creation is therefore a theological one, including static concepts of wholeness, purpose and "flourishing". It has very little relevance to modern conservation science, which understands nature as dynamic and competitive. Both disciplines agree that there is a moral dimension to our understanding of nature, which raises ancient and deep questions about humanity's place in it.
14. Within any cultural group, traditional understanding of nature has always provided a template for moral and social behaviour, bound together in universally accepted myths. During the period of the historic estrangement of science and religion, new technical knowledge has destroyed the links between facts and values and undermined community values and responsibility. In contemporary times, the breakdown of the link between the prevailing cultural story and the world as described by the sciences has decoupled reality from morality. At the same time, the parallel breakdown of community has loosened the old systems of reciprocal altruism. The combined effect has been to weaken both religion and community spirit, and to allow free-market economics to dictate the direction of development of society according to its own supposedly neutral but actually destructive values. Hence, an examination of what might be involved in taking the Fifth Mission Statement seriously requires a survey of relevant aspects of economics, social behaviour and game theory as well as the more obvious subjects of ecology and theology.
15. In the prevailing free-market economic world model, humans are assumed to be rational, independent agents making decisions in their own best interests regardless of the common good. Many environmental consequences of their

- private decisions are classed as “externalities”. Commercial operators are encouraged to privatise benefits and socialise costs, each to the fullest extent allowed by society. Hence vital group-level issues such as the capacity of an ecosystem to sustain life, or the network of personal relationships within a human community, are insufficiently accounted for, and very often damaged.
16. When Adam Smith proposed his idea of the “invisible hand”, by which success in private business automatically benefited the community in general, he assumed that private business decisions were always restrained by shared community values, but that no longer applies, if it ever did.
 17. The so-called “conucopian economists” assume that technology will support unlimited exploitation of planetary resources, but ignore the biological limits to human activities. Humans already monopolise >50% of the net primary productivity of the land and oceans, so one more doubling of the human population (expected before 2050) would not only introduce massive human distress but also leave practically nothing for natural ecosystems.
 18. Criticisms of the free-market model are extensive and decisive, and fully accepted in academia; the need now is to find ways of changing the normal operations of the global economy.
 19. Sustainable management is possible and urgently necessary, but it is not the same as sustainable development, which may be neither. Sustainable management is already required in New Zealand law (under the Resource Management Act 1991) but there are still formidable problems in educating the general population to take their share of the necessary collective responsibility.
 20. Radical reform of the business environment is possible, and in fact already beginning. Although deeply threatening to powerful international corporations; it offers the only hope of slowing global degradation in time.
 21. When resources are widely scattered, or human communities too large for personal communication or unstable, as in modern society, co-operation for the common good is jeopardised, for reasons well modelled by various forms of game theory such as the Prisoner’s Dilemma: altruism is too risky, because it never pays to restrain personal interests unilaterally or to co-operate with strangers.
 22. However, in a healthy and stable local community, the conclusions from game theory are different: repeated rounds of Prisoner’s Dilemma played with the same partners can define the conditions under which co-operation is the best longterm strategy, and the result is the development of complex systems of reciprocal altruism within small groups. These conditions can be observed among the higher non-human primates, and, in conjunction with gene-culture co-

Summary

- evolution, were important in the extension of reciprocal altruism into systems of morality among the earliest humans.
23. However, most important environmental decisions have to be taken in the context of large human groups, which naturally compete with each other. So in general, environmental ethics has to be taught in spite of human nature, not in concert with it.
 24. Studies of the living higher primates give us a clue of how our earliest ancestors lived. Within their social groups, essential to individual life and security, individual decisions were governed by shifting combinations of personal versus group interest. Groups were defined by cultural as well as biological criteria, especially various forms of reciprocal altruism and cultural group selection. Altruism within the group was strong, and matched by rivalry between groups.
 25. Cultural selection is a process similar in principle to natural selection but operating on memes (ideas). Humans inherit both memes and genes, and the study of their interactions defines the theory of gene-culture co-evolution. Conflicts between the two sorts of heritable information are common, and underlie most moral dilemmas, including those inherent in the Fifth Mission Statement.
 26. Genes and culture may interact in various ways: culture may mediate natural selection, or genes may mediate cultural selection; or the two may enhance, ignore or oppose each other. Group selection at the cultural level which also mediates natural selection at the genetic level is possible but difficult to achieve.
 27. Since the Fifth Mission Statement deals largely with moral issues, we need to understand the origins of morality. There are various conflicting models, all of which concede that morality is based on evolved behaviour patterns, although its full development is uniquely human. Acceptance of its evolutionary roots requires some reassessment of traditional philosophical doctrines concerning freedom, equality and unconditional altruism.
 28. Sociobiology, which applies evolutionary arguments to human behaviour (often ignoring culture and group selection) seeks to understand morality in terms of gene-based selective advantage. To the extent that any moral behaviour advantages the group, it must work by self-deception. But this view can be criticised because it falls into the fallacy of misplaced concreteness, and because it confuses evolved, impersonal and unconscious biological altruism with cultural, personal, conscious morality.
 29. Sociobiologists and other gene-centred theorists regard morality as a conscious rebellion against natural selection, and dismiss religion as merely another survival mechanism. But the Christian biologist can answer by pointing out that true human ethics might well be a later development of religion, just as evolution commonly takes a character evolved for one purpose and uses it for another.

Morality can therefore be seen as the fulfilment of nature, not a rebellion against it.

30. Biotheology is a way of studying the links and parallels between the natural, human and religious worlds without assuming the superiority of any one over the others. Each is able to contribute insights that illuminate the separately-developed understandings of the others. Their interactions define areas of conflict in the overlap zones, many of which are relevant to the Fifth Mission Statement. In general there has been a progressive development from natural selection in nature, through cultural selection in human society, to the abandonment of all selection in true Christianity.
31. Biotheology is able to make some new and interesting comments on traditional Christian doctrines, including many of Jesus' specific teachings, plus original sin, baptism, predestination, the Body of Christ, heaven and hell, the existence of God, the role of women in history, the virgin birth, and the apocalypse.
32. Biotheology also offers a parallel account of Christian history interpreted through the logic of gene-culture co-evolution, which underlies the traditional interpretation without invalidating it. The story of the Fall and how it has been manipulated for various non-theological purposes is particularly interesting.
33. I use gene-culture interaction models to offer an analysis of Christian attitudes towards conservation issues, using data from a survey dating from the mid 1980s. The results suggest that (a) Anglican beliefs have little effect on support for conservation; (b) the extreme right-wing attitude characteristic of recent governments is a case of gene-culture opposition, which is in the long run not in the best interests of the country; and (c) Anglicans should argue for moderation both of the extreme idealist view that values nature above social justice, and also the extreme commercialist view that values profit above either. Rather, we should promote greater investment in ethically and socially responsible environmental protection.
34. There is an important distinction between public goods, which are abundant enough to be available to every user regardless of the number of other users, and common-pool resources, which are limited in supply so that what is taken or damaged by one user is not available to other users.
35. There is also a spectrum of access rights, from private ownership at one end to free access at the other; in between is common property, to which access is restricted to a particular well defined group. When group decisions on management are well organised and free riders excluded, local commons can survive for centuries.

36. Most aspects of the human environment which are at risk (forests, ozone, biodiversity, fisheries, clean water etc) are common property for which local management has degenerated into free access. The legal and social problems of organising just and equitable collective action to manage the common property of a very large group are briefly reviewed.
37. If a system of social control of a common-pool resources breaks down, leading in effect to open access, the result is usually irreversible damage to the resource. Garrett Hardin calls this the Tragedy of the Unmanaged Commons. It can be explained in terms of a Prisoner's Dilemma, in which each user plays against all the others as a group.
38. Three forms of the dilemma which can be observed in New Zealand are described. *Muldoon's Law*; In management of a common resource, strategies that are individually rational can be collectively disastrous. *Berk's Law*; The threat of damage to or depletion of an uncontrolled common resource increases its value and stimulates competition among free individuals to harvest it all the faster, regardless of the future. *Bolger's Law*; Individuals will tend to resist restriction of private access to common resources, even to protect the long term interests of the community.
39. To protect common-pool resources from over-exploitation, three main strategies are possible: privatisation, regulation and collective action. Each has its own advantages and disadvantages, depending on the type and location of the resource to be protected. All require monitoring with systems of rules and sanctions; the general absence of these explains why the declarations produced at Seoul and Rio have so far had little effect.
40. Caring for creation is a matter of culture and values as well as of scientific management. There is a spectrum of cultural attitudes to environmental ethics in New Zealand, along which individuals find their place depending mainly on their attitude to important philosophical questions such as the definition of nature and the place of humanity in it, and the relative rights and wrongs of preservation versus use.
41. It is possible to distinguish four main groups of people interested in environmental management. At the extreme preservation end of the spectrum are the idealists: in the middle are the traditionalists and the pragmatists; at the other end are the commercialists. The four groups differ in their attitudes to many questions, such as which values are to be protected, whether introduced species should be utilised or eliminated, what are the main priorities for conservation funding, how far should the spiritual values of the Treaty be respected, etc. The differences are

- much more ideological than racial, and they frequently complicate conservation decisions that were formerly made on purely scientific grounds.
42. The chronic shortage of funds for conservation has forced DoC to construct a priority system to rank the conservation values at risk, but this is difficult when the concept of “intrinsic value” is not defined in the Conservation Act 1987, and other groups have different ideas about what is valuable. Market-oriented organisations such as the Business Round Table, which dismisses the idea of intrinsic value as meaningless, are making serious bids to gain control of the conservation estate.
 43. Promotion of the Fifth Mission Statement to a sceptical world will inevitably invite public inspection of the doctrine of creation. Critical realism requires that we take the traditional view seriously but not literally. All credible theologies have to be continually updated in the light of contemporary secular knowledge, so this is not a new responsibility.
 44. Science describes the processes of evolution under which the whole natural order developed from simple beginnings. It has a lot in common with the Old Testament creationist tradition, which asserts that God created the conditions under which natural processes were free to operate. Both allow for mistakes, which are the necessary corollary of freedom, and thereby explain the origin of evil. Both reject the Augustinian interpretation of the Eden myth and the commonly supposed need for nature to be redeemed. The integration of these two traditions is more a matter of elimination of errors and misunderstandings than of formulation of new doctrines.
 45. The sociobiological theory of the origin of morality as self-deception is valid to the extent that many moral imperatives can be understood as good strategies giving a selective advantage in the evolved social game of tit-for-tat. But true Christian ethics goes beyond evolution, by deliberately abandoning all forms of social and natural selection and depending upon the grace of God.
 46. Organised religion has an important role to play in the coming environmental crisis, provided it does not attempt to domesticate the debate by claiming that Christianity has been green all along, or to hang on to its old exclusivist claims to truth. It is one of very few organisations influential in our society with roots going back to before the modern crisis developed. It can take a cool but loving view of human nature and its multiple deviations.
 47. Collective agreements on local environmental management need to take account of the stratification of most societies and the effects of that on the prospects of organising collective action.
 48. Some Christians advocate reviving the Biblical idea of stewardship as a vehicle for the idea of caring for creation, but others point out that it is not easy to

translate that ancient idea into the modern world: it assumes that humans are outside nature rather than part of it, that the reason God needs to be represented by a steward is that God is absent from the world, that it is possible to weight all competing interests, and that the differences between the various Biblical ideas about stewardship are unimportant.

49. We need to recover the relationist interpretation of the concept of *imago dei*, which would transform our concept of stewardship from dominion over nature to service to nature. This would require reconsideration of the modifications to Christian theology made in post-Constantinian times.
50. The Fifth Mission Statement involves far more than promoting recycling programmes, important though they are. It should concentrate the resources of the Church on attacking the causes of the environmental crisis rather than the symptoms of it. It should start in its own house, by accelerating the already existing discussions on updating traditional creation theology in relation to secular knowledge.
51. The difficulties in the path of such revisions include the perceived threat to faith, the perceived distance between what goes on in theological academia and what the ordinary people believe, the general lack of scientific education among congregations, and the multiple consequences of tinkering with basic theological propositions.
52. There is an urgent need to educate congregations on the metaphorical nature of theological truth, and of new metaphors that more clearly convey ancient truths to the modern mind.
53. The Church could sponsor religion and science education programs in schools and colleges, and encourage a higher level of science education among ordinands.
54. The recent Hikoi of Hope demonstrated the potential leadership of Anglican Church in co-ordinating domestic and international protest against economic and environmental injustice – the inseparable concerns of the Fourth and Fifth Mission Statements. In future years the Church could build on that momentum by further publicising the Jubilee 2000 campaign against international debt plus its associated programme of debt-for-nature swaps; by taking the initiative in co-ordinating a New Zealand version of the Real World Coalition; by supporting and publicising business reform movements such as The Natural Step; and by using ethical investment funds for its own affairs and encouraging Church members to do the same.

Summary

55. Proponents of the Fifth Mission Statement must also be prepared to consider the social position that the Church has enjoyed since Constantine, and the potential changes it might need to make in order to fulfil its primary prophetic role.
56. The Anglican Church is in a unique position to offer the leadership that New Zealand society will need if it is going to find its way through the present and future crises. It is possible that the predicted catastrophe will be averted, although no-one informed about the issues is optimistic, and time is much shorter than the general population believes. But if not, the Church still has a vital role to play in picking up the pieces. Because it has sources of strength and meaning supplied from outside the assumptions of free-market economics, and also is the only contemporary social organisation to have had direct experience of two previous catastrophic social collapses (after the falls of Jerusalem and of the Roman empire), a Church that really lives a vital, rational, passionate and compassionate form of Christianity will be a beacon of grace in a disintegrating society, and it has a solemn duty to prepare itself for that role.

APPENDIX 1: SOURCES AND LIMITATIONS

It is normal in academic practice to demand full referencing of all material to primary documentation only, and to frown upon more than a passing reliance on quotation from secondary sources. For the average, tightly defined thesis subject, that rule is wise and perfectly proper. For the present work, ranging widely as it does across the boundaries of several very different disciplines, such a requirement would have consumed excessive time and made the references section even longer than it is already. I therefore took the decision to save time and space, when referencing background information, by quoting from well-documented books, provided these will, at one remove, still lead readers not only to the primary sources but also to far more comment on them than I could attempt here.

Theology is an ancient discipline that has occupied many great minds down the ages, and it was obviously impossible to survey even a fraction of this huge historical investment of study during the preparation of this thesis. I therefore took a second decision, to confine my attention to authors who: (1) take very seriously both the full implications of contemporary Biblical and scientific scholarship for our understanding of God, and the extent of the environmental crisis (“it is now unpardonable for theological reflection to proceed without grounding itself in a biological self-understanding... ..contemporary biology [is] a *normative* resource for the theological enterprise” (Rue, 1989:8); (2) are willing to rethink traditional theological models, including for example the place of humanity in nature, the Fall in both literal and metaphorical senses, the dominion model of stewardship and the penal substitution doctrine of the atonement, in the light of that biological self-understanding; (3) are willing to at least discuss active repudiation of various errors of the past or obstacles in the path of a global theology of the future, such as the exclusivist claim for Christian truth. The emphasis on contemporary scholarship is necessary, certainly for evolutionary biology, ethology and primatology, because these fields have made rapid advances in recent years, and the background they provide is very different now than it was for authors working even only 20 years ago.

These criteria eliminated from immediate consideration a long list of respected authors whose work may still be relevant in other respects, even if they did take into account the evolutionary science of their own day, but still left a substantial set

(Barbour, Hefner, Küng, McDaniel, McDonagh, McFague, McGrath, Oelschlager, Page, Peacocke, Polkinghorne, Primavesi, Reuther, Thiessen, and Ward, among others, but not Moltmann, for reasons discussed by Walsh (1987)). It is obvious that no single thesis could do justice the work even of this group, and I regret the lack of space to discuss the historically important views of earlier authors (Tielhard, Temple, Raven...) in any detail at all. Many of them are reviewed by others, especially Barbour and Peacocke.

I became convinced that it must be possible to construct a dialogue between faith and reason in relation to caring for creation long before I realised that the dialogue I sought had been going on for years. I had already developed many ideas, which I thought were independent, original insights, before I found that others had travelled the same paths before me. Hence, I have had to acknowledge the priority of previous authors by inserting literature references retrospectively into several sections of this thesis long after they had been written. Fortunately, I have seldom had to change my arguments in so doing, which is a minor consolation. The most significant of these retrospective sources are Theissen (1984), Peacocke (1993), Oelschlaeger (1994), Cavanaugh (1996) and Barbour (1997). All of these books pursue lines of argument more or less similar to my own (though all include some points of view different from my own), but I read them only when my own ideas were already well developed.

The design of a dissertation addressed to a mixed audience, as this one is, required a difficult decision on how much background material to include. The science-religion debate is inhabited by two sorts of people: theologians exploring science, and scientists exploring theology. I have met far more of the first than of the second, and have also observed that their efforts to understand the arguments may be hampered if scientists fail to explain important background concepts that all scientists normally take for granted. Since this thesis was supported by a theological foundation, and is intended to benefit the Anglican Church in New Zealand, I have opted to make it comprehensible to readers who have no specialist biological background.

APPENDIX 2: A SUMMARY OF RELEVANT EVOLUTIONARY THEORY

This section is designed to assist readers with non-biological backgrounds to appreciate the arguments presented in the main text that rely on evolutionary ideas. Fellow-biologists need not read it unless they wish to check my interpretation of current theory or the New Zealand examples I use.

1 The modern synthesis

The basis of our contemporary understanding of evolution by natural selection can be summarised in a few words: variation, competition, differential survival, and cumulative change (Appendix Table 1) . It is called the modern synthesis because it is

Appendix Table 1 How the processes of selection work in the animal and human worlds

Processes of selection	Animal world	Human world	Scripture
1. Variation in characters	Speed of horses	Makes of cars	Ex. 7:4: Israel vs Egypt
2. Units of information	Genes of successful sires	Copyright designs of components	Memorised texts
3. Handing on the heritable variations	Stud farms	Maker's style	Ex. 12: 26: Passover ceremony
4. Competition between traits	Races, shows	Free market	Deut. 30: 15: Moses' challenge
5. Best traits favoured	Bloodstock records	Consumer choice	Jos. 24: 15: Joshua's pledge
6. Accumulation of best traits	Wild pony to Sir Tristram	Horseless carriage to Rolls Royce	Mat. 5:17: Moses to Christ

a twentieth-century integration of the two corner-stones of evolutionary theory, independently discovered at roughly the same time in the nineteenth century. If

Darwin had known of Mendel's proof of the particulate nature of inheritance as he developed his insights into the action of natural selection, the history of biology would have been very different. Further details are given by Williams (1992) and Maynard Smith & Szathmary (1995).

1.1 The difference between information (genes) and materials (bodies)

It is well known that every living organism contains a unique collection of genes, heritable units of coded information. Together they co-operate to control the building of the body and all its unconscious functions such as breathing and digestion, and they influence important characters such as appearance and behaviour. But it is less well known that there is an important distinction between the genes and the individuals holding them. Grasping the significance of that distinction is the key to understanding modern evolutionary biology.

A famous champion racehorse sire such as Sir Tristram could not live indefinitely, but his owners' interests were not damaged by his death⁵⁵ because they have another young stallion of Sir Tristram's blood line, Zabeel, who is already standing at stud in Cambridge, and at least eight others are doing the same for other owners. They, like all bloodstock breeders, work on the principle that, in the long term, genes are more important than any individual sire, because they will outlive him. Sir Tristram's body was the product of a unique, short-lived and unrepeatable combination of genes, compiled from the previous generation (his dam and sire) and split up in the next (his foals). By contrast, the genes themselves are effectively long-lived, since they replicate themselves with astonishing accuracy and pass on copies to each new generation of foals usually unchanged. The body called Sir Tristram eventually wore out, but the genes that made him a great racing sire will live on in his descendants and in the stud books.

Genes are carried by DNA, but it is the immaterial coded information, not the material molecule of DNA itself, which comprises the heritable data. Some genes controlling basic metabolic processes such as respiration and digestion are so stable, and

⁵⁵ By the time he died in 1997 Sir Tristram was 25 years old and had fathered 44 Group One (the highest category) winners.

mutations in them so immediately fatal and rapidly eliminated, that the copies we see have remained unchanged for millions of years (Williams 1992).

The genes will be mixed up in different sets in each foal, and not all the new combinations will be as successful as they were in Sir Tristram. In every generation, each new set of genes will build bodies that interact with each other, and not all bodies will be equally successful in passing copies of their genes to the next generation. In George Williams' terminology, individuals are physical, temporary, highly variable, disposable *interactors*, or bodies; genes, by contrast, are non-physical *codices*, replicable coded information, faithfully passed down through the generations until they are either altered by mutation or lost. Bodies interact with each other in the material domain, and genes interact in the information domain. Both are real, but only bodies can experience life. Sheet music depends on a real and intelligible code, but it is not real in the normal sense until a musician lifts it off the page and into our sensory experience.

1.2 Variation

Over the long term, new variations are added to the gene pool by chance mutations - imperfections in the processes of copying genes. Most such mutations are unhelpful, and are rapidly weeded out. A few of them are a genuine improvement over the alternatives on offer, and these are (rarely) incorporated into the pool of variation that accumulates over the generations. Over the short term, a second process, recombination, increases variation among individuals by ensuring that existing parental characters pass through to offspring in unexpected ways. The continual reshuffling of the variants available in the family gene pool produces, even among close relatives, many distinct individuals in every generation, all different in appearance and personality. The best stallions such as Sir Tristram serve only carefully selected and well-bred mares. Even so, many duds appear among the foals and are quickly sold off. This recombination process explains the common observation that, without ruthless selection, family dynasties, in racehorses or humans, seldom perpetuate the particular qualities of their founders into the indefinite future.

In diploid* animals, every individual has two copies of each gene, one inherited from each parent. The two copies usually form a complementary pair of alleles*, one dominant (usually expressed in the body) and one recessive (expressed only if there

is no dominant allele of the same gene in the same body). They do not necessarily have the same effect. The two alleles are separated during meiotic sex*, the processes of producing eggs and sperm, so each germ cell carries only one copy of each; the pair are reunited at fertilisation. Very few physical conditions are controlled by only one or a few genes, but at least 4000 human disabilities are known to be caused by single-gene defects, such as cystic fibrosis or muscular dystrophy (Wolpert 1992:166). Some are associated with the dominant of the two alleles, and appear in every child that inherits a copy; others are associated with the recessive allele, and usually remain unexpressed. Many people carry recessive alleles for serious diseases without ever being aware that they have them. They find out only if they happen to marry another unwitting carrier, in whom the effects of the recessive allele are also masked. But the disease will show itself in every one of their offspring carrying two copies of the recessive allele.

Almost all other characteristics are controlled by a large number of genes, all in a great variety of combinations, and their effects are controlled by their interactions with each other and with still other moderator genes. Hence there is always an enormous amount of variation in the gene pool of any population, and in the potential variation in physical characters. The possible combinations are endless - far more than that in a pack of cards, which contains only 52 characters but can still be reshuffled and dealt out in a virtually unlimited range of possible hands. So the ancient Christian conviction that every individual human being is unique and irreplaceable is confirmed by genetics.

There is a great deal of duplication and redundancy in any species genome, which means that even though we can read the genetic code, we do not necessarily understand it. As Jones (1996) puts it,

although the technology of ordering the letters in the DNA alphabet is well advanced, nothing is known about what most of it does. Working genes are, it seems, oases of sense in a desert of nonsense (p.xi).

Such extensive duplication allows room for some rare variations to remain hidden for long after they have outlived their usefulness. For example, the lower legs and single hooves of horses are in fact derived from the middle digit of the standard vertebrate five-digit foot. The genes controlling the other four digits are no longer useful, and are usually repressed. But they are still there, and in normal horses they produce the splint bones and the "chestnuts" - a horny patch on the inside of each leg. Very

occasionally an abnormal foal will turn up which has what look like two extra mini-hooves, because the full versions of the genes for two of the ancestral toes have for some reason shown themselves, inappropriately and out of context, in a modern animal that has no use for them. Animal breeders call three-toed horses and other such monsters “throwbacks” and get rid of them immediately. Biologists, recognising their significance for the sciences of genetics and evolution, call them “atavisms” - freak individual animals showing an ancient character - and put them in museums (Gould 1983a).

1.3 Natural Selection and competition

The sheer fecundity of life is staggering, and easily demonstrated by any simple calculation based on the reproductive powers of rabbits or bacteria. But fecundity is not the same as reproductive success, and the general rule in nature is that there is nothing like enough room for all individuals or all variants to survive. Inevitably, some will live and others will die. The key question is, which?

Polar bears hunt seals on the winter sea-ice of the north polar basin, but that habitat has been available only since the Pleistocene period, about 2 million years ago. The common ancestors of contemporary polar and grizzly bears were certainly brown or black, and those that first explored this new habitat were easily spotted against the snowy background. In the competition for survival, bears that happened to develop a gene⁵⁶ for white fur were more likely than others to survive and breed, and pass on the genes for white fur to their young. It is probably safe to predict that the gene for white fur is so successful that every single living polar bear must have a copy of it, even though the mutation is so recent (polar bears have been a distinct species for <100,000 years) that they retain the dark skin of their brown-furred ancestors underneath their white fur (Jones 1996: 185). Such successful genes are “fit”; ie, they have selective value appropriate to the conditions. Conversely, natural selection eliminates unfit genes from the gene pool - probably very rapidly in the case of any reappearance in polar bears of the gene for their ancestral brown fur.

⁵⁶ The technically correct but unwieldy statement here should be “bears in which a mutation at the locus of the gene for fur colour provided an allele for white”, but the normal, simplified terminology is easier reading.

Appendix Table 2 The continuity of selection processes in the animal, human and religious worlds, and Jesus' response showing the consequences of God's abandonment of all selection

Mode of selection	Proverbial description	Natural world	Secular world	Religious world	Jesus' response
Individual selection	"Look after Number One"	Flowers	Fashion/fast cars	Solomon (1 Ki 10:4)	Mt 6:29
		Birdsong	Army displays	Goliath (1 Sam 16:4,11)	Mt 26:52
		Rats at tip	Wealth	Rich fool (Lk 12:19)	Lk 12:21
		Raptor chicks	Sibling rivalry	Cain/Abel (Gen 4:4-5)	Mt 5:22
		Cuckoos	Adultery law	Stoning (Jn 8:4-5)	Jn 8:11
		Pack hierarchy	Competition for social status	Hypocrites (Mt 6:5b) Disciples (Mk 9:33-4)	Mt 6:5a Mt 9:35
		Parasites	Bludgers	No work, no eat (2Th 2:10)	Jn 13: 34
Kin selection (relatives)	"Blood is thicker than water"	Lionesses	Extended families	Rich man's brother (Lk 16:27)	Mk 3:33-5
		Bear & cubs	Any mother	Solomon's judgement (1Ki 3:27)	Mt 10:37
Reciprocal altruism (non-kin)	"You scratch my back, I'll scratch yours"	Mongoose	Treaties	Solomon (1 Ki 3:1)	Mt 5: 46-7
		Ox peckers	Mutual dinner invites	Golden rule (Mt 7:12)	Lk 14: 13-14
Group selection	"All for one, one for all"	Meerkats	Tribal societies	Moses' loyalty (Heb 11:24-6)	Mt 5:43-4
Beyond selection	Unconditional love	No equivalent	Romantic idealism	Abraham (Gen 22:12)	Mt 10: 38-9 Jn 15:12-15

Animals face competition both within and between kinds. Hyenas have to compete both with lions for game and with each other for meat at the kill; the European rats that colonised New Zealand from the settler's ships competed for living space both with each other and with the Polynesian rats that had arrived with the ancestors of the Maori.

Wherever there is variation and competition, there will be *differential* survival. Natural selection is not the same as a disaster, such as a landslide which kills everything in its path, good and bad alike. It discriminates between variants, favouring some and eliminating others. There is nothing deliberate about it: it is just that individual animals carry different combinations of genes sampled from the common gene pool of the population, and some will be more successful than others in returning copies of their genes back to the pool (Williams 1992). The basic rule for success in competition at the level of the gene is: "Look after Number One" (Appendix Table 2) – it cannot work in any other way.

Variation is the essential pre-requisite for natural selection, and, over time, for evolution. The ultimate sources of variation (mutation and, more often, recombination) are random in origin, but that does not make them disorderly: in physics also, orderly macro-level phenomena are derived from random micro-level events (Bartholomew 1984). Although it was chance that produced the original allele(s) for white fur in the early polar bears, the reward for the individuals that carried them in a snowy environment was entirely predictable from the rules of natural selection. It is the *interplay* of chance and law that makes evolution both entirely logical and at the same time also entirely unpredictable (Peacocke 1993). The role of chance in long term evolutionary change is a huge subject in itself, but over the short term it is less important than the small changes in gene frequencies from one generation to the next, which are caused by the orderly processes of natural selection. The cumulative result is long-term genetic adaptation.

1.4 Adaptation: the long-term, accumulative process of change

There are a very few extremely stable environments, such as the deep sea, in which ancient forms can survive virtually unchanged for millions of years - such as the so-called "living fossil" fish, the coelocanth. But over most of the earth's surface the natural environment is always gradually changing, on time scales ranging from daily

to glacial. If the changes are very slow, existing species can keep up with them by “Red Queen” processes, named after the character in *Alice in Wonderland* who had to keep on running in order to stay in the same place. If the long-term result of continuous adaptive change in the same direction is a new species fitted for life in a new environment, it can lead to speciation by descent. One of the best examples of this comes from New Zealand. About 8-10 million years ago the South Island was virtually all flat land covered in lowland forest and inhabited by parrots much like modern kaka. As the earth shook and the Southern Alps slowly built up under their feet, the birds adapted gene by gene as the altitude of their homeland increased inch by inch. These slow, cumulative changes in the landscape and in the birds eventually produced (among other alpine forms), the tussock grasslands and the kea (Fleming 1962).

Where such processes have been left undisturbed for a long time, and local populations become separated by barriers of habit or geography for a few aeons, the result can be a great range of new species. For example, a large, stable, ancient continental landmass offers a huge variety of habitats for birds that feed in, say, the kingfisher fashion, and over the millenia the different local breeding groups have accumulated slightly different sets of genetic changes causing local variation in colour, size or behaviour. If two non-interbreeding groups remain separate for long enough, they will eventually develop into separate species - mutually infertile by definition - and if they meet again they can co-exist without losing their separate identities. New Zealand, a recent and much smaller landmass than any continent, has only one species of kingfisher (and that is a recent immigrant), whereas North America has three, Australia has eight, and South Africa has ten.

By contrast, temporary and local variation can be met by small, often reversible adjustments. Where local variants meet, they may hybridise into a still another form, if the differences between them have not reached the level of full species. Red deer and wapiti deer have done that in New Zealand, the only country in the world that supports both. The escaped domestic pigs of the early New Zealand settlers, which within a few generations reverted to the fierce and hairy boar-like appearance of their original ancestors, are not a new species because they would still be able to interbreed with them if there were any true wild boars here.

In sum, adaptation is the continuing running adjustment of living things to their habitats. The ecologist G.E. Hutchinson (1965) compares the process with an

“ecological play” producing new characters during one long continuous performance in an “evolutionary theatre”.

Natural selection is a very slow process, because by definition it works by differential survival and *reproductive success* of individuals. But over the very long term – tens of millions of years - the mechanism of natural selection applied to tiny increments of advantage can produce unimaginable changes. For example, the earliest whales were descended from terrestrial animals that returned to the sea complete with ordinary, doglike paws. The long-term accumulation of the complex of genes controlling small differences between individual early whale-ancestors in paw width eventually gave their descendents broad swimming flippers, still based on the bone structure of the five-toed paw of their predecessors.

The agents of natural selection can be anything - shortage of food, severe climate, predators, parasites - that challenges individual animals to show what they are made of. Stress serves to distinguish between those that happen to be carrying appropriate genes and those that are not. Natural selection is nature’s equivalent of a kennel club judge asking the competitors to show off their paces. The process used to be called “the survival of the fittest”, but that is a misleading name, since it is not the animals themselves that are being judged fit or not, but their genes. In the same way, ultimately, kennel club judges concentrate on the characters that meet the breed specifications rather than the individual animals in which they happen to be represented this year. The current champion dog won the crown because it demonstrates those breed specifications more perfectly than any other dog, not because it is *itself* perfect.

Natural selection is not itself a creative process - it does not *create* new and fit variations, only eliminates unfit ones. But it frequently produces new structures by adaptation of existing ones. For example, the small and specialised bones that form the mammalian middle ear and voice box can be traced back over the millenia to gill arches of far distant ancestral fish (Gould 1993a). The air sacs that enabled certain primitive fish to survive temporary droughts were modified by their descendants, the modern bony fish, into the swim bladder that provides neutral buoyancy in water of any depth and pressure (Gould 1993c). The standard vertebrate limb has produced the otter’s flipper, the cat’s paw, the horse’s hoof and - by different and independent adjustments - both the bat’s and the bird’s wing.

Because competition so often eliminates the weaker of two species that are too much alike, it is usually safe to infer that similar types of animals or plants which still survive have developed alternative ways of life that allow them to live together *without* competing. For example, there are plants that specialise in colonising bare ground, and plants that come after them in an orderly succession from low, quick-growing, short-lived shrubs to the tall, slow-growing, long-lived forest trees. Within many long-established forests, each of the dozen different kinds of birds that can be found together in any given area forage in the trees in a slightly different way. They do not compete because they are searching for insects that live in slightly different places.

Evolution is the unplanned *consequence* of all these processes - variation, competition, natural selection, differential survival and cumulative changes in gene frequencies - generating and then choosing between more or less appropriate sets of characters that decide which individuals will succeed in surviving and breeding – thereby returning those genes to the species gene pool. Natural selection operates to eliminate the unfit *individual* bodies plus the genes they carry, and accumulate the fittest genes from the bodies that best survived and bred in the previous generation. The genes that control the best characters produce the only bodies we see; all the rest have been eliminated.

2 The major transitions of evolution

Modern living organisms are unbelievably complex, but they are derived from much simpler ancestors over the (roughly) 3000 million years since life began. That implies an increase in complexity over time, which is true in some lineages but not in all, and was not inevitable in any. Maynard Smith & Szathmary (1995) have assembled an impressive account of the history of life, showing that the increase in complexity has depended on a series of significant transitions in the way in which genetic information is transmitted between generations. Of the eight transitions they list, five took place before the beginning of the fossil record, so deductions about them were impossible before the development of molecular biology. Some were unique, such as the origins of the eukaryotic* cell, of meiotic sex* and of the genetic code itself. Others, such as the origins of multicellular organisms and of animal societies, have happened several times independently.

After every transition from one level of organisation to the next, entities that were capable of independent replication before the transition could replicate only as part of

a larger whole after it. This observation raises a problem common to each transition in turn: why did the formerly independent entities allow themselves to be taken over? why did not natural selection between entities at each lower level disrupt integration at the next higher one?

The answer most consistent with the facts is that of immediate selective advantage to individual genes. For example, the cells of all multicellular organisms are descended from single-celled protists, once capable of surviving on their own, but today they can exist only as parts of a larger organism. But all multicellular organisms develop from a single fertilised egg, so all their cells are genetically identical, and the genes carried by each cell can survive only if they all co-operate to build a functional multicellular body. It is only where the genetic interests of all parties are identical⁵⁷ that there is no competition. This insight from cell biology is enormously significant in understanding failures in human co-operation, from Brennan's question (S.5.1) to the Body of Christ (Appendix 3.5).

Two processes, symbiosis and epigenesis, are particularly significant here. *Symbiosis* means the living together of entities that are not genetically identical. Because their interests are not the same, there is a range of possible outcomes, from mutualism beneficial to both, to outright exploitation of one by the other. The long history of life has produced a huge variety of animals and plants that have co-evolved to help and exploit each other in complex ways, and the degree of their co-operation is predictable from the degree of their relatedness. *Epigenesis* refers to an increase in complexity which is not due to genetic change in the usual sense (at the level of the DNA), but to the fact that different genes are active in different cells (so muscles, bones, nerves and blood all develop from an identical set of instructions) or in different castes of the social insects (workers, soldiers, drones) - and, perhaps, in different people.

Social behaviour in humans and other mammals is especially interesting because it involves close co-operation between individuals that are all genetically different. To understand how sociality arose, we must explain why independent individuals live together and tolerate all the various problems of communal life – including conflicts of interest at various levels and, often, reproductive disadvantages. To understand the

⁵⁷ Later in life, accumulating mutations in the somatic cells introduce relentlessly increasing genetic differences within the body, which sometimes allow cancer and always lead to ageing and death (Jones 1996).

maintenance of animal societies (including human ones) we must explain how they manage to resist cheating (Maynard Smith and Szathmary 1995: 264). These are old questions – they have puzzled thoughtful people since Biblical times – but answers have been developed only in the last 30 years.

3 Conflicts of interest and the levels of selection

Until the 1960s it was commonly assumed that natural selection in the non-human world must always work for the good of the species. Christians of the Teilhardian school liked this interpretation, because it readily fitted with their idea of the workings of God pushing the collective development of creation in the direction of the foreordained emergence of humans capable of making moral decisions (Galleni 1992). The problem is that this view cannot account for many contrary observations in the real world, which are inescapably real but very *bad* for the species. The keys to understanding them are to recognise (1) the difference between the realm of short-lived, material bodies and the realm of long-lived, immaterial information, and (2) the hierarchical organisation of nature and the multiple levels (within-group and between-group) of selection (Wilson 1997b).

Like the kennel club judge, natural selection chooses primarily between alternative sets of genes, ie particular heritable characters. It has to select between bodies interacting with each other in the courses of their lives, because genes can only show their effects in bodies: but, unlike the kennel club judge, natural selection is totally uninterested in the long-term good of the breed. So male lions taking over a pride of females soon kill all the existing cubs in order to reduce the time before the females will come into heat and produce cubs for their new mates. It seems cruel and wasteful for the species as a whole, but that is irrelevant to the outcome; what matters is that the next generation of cubs will be fathered by the incoming males. Exceptions to the rule can be explained in the same terms. For example, male foxes taking over a new mate do not kill the cubs sired by their mate's previous partner, but that is not because foxes are more compassionate than lions. The reproductive cycle of the vixen is seasonal, and she could not immediately produce cubs for her new partner whether the previous litter survived or not. Meanwhile, if the existing male cubs grow up but cannot find territories of their own, one or more may stay and help its mother and stepfather rear the next generation of cubs. The explanations for why these variations in parental attitudes among male animals persist became clear during a decisive demolition of the good-of-the-species explanation by Williams (1966).

Current synthesis theory asserts that only genes (or their alleles) which control behaviours that convey some advantage over the alternatives available in this generation will be copied and passed on to the next generation. The genes of male lions of type A that kill their predecessor's cubs will be passed sooner to a new generation of cubs than the genes of hypothetical males of type B that spare their rival's type A existing cubs "for the good of the species". Within a few generations, Type A genes will predominate, and the more merciful type B genes will be eliminated from the population. Type A genes control behaviour that has the effect of advancing their own interests, whereas Type B genes do not. Dawkins (1989) used the metaphor *The Selfish Gene* to explain this process to general readers. Theoretical models based on natural selection at the level of the gene have been spectacularly successful in stimulating research and explaining a huge range of observations in animals, and they have generated an enormous literature and very many important insights into biological processes. They are also a necessary, but *not* a sufficient, prerequisite for understanding the biological basis of human behaviour (Appendix Table 2).

3.1 Altruism: group selection

Tennyson's description of nature as "red in tooth and claw" is well-known but not entirely correct. The natural world also provides many examples of what looks like real altruism. A mother bear defending her cubs is a truly dangerous animal, ready to take real risks to her own life in order to drive away any threat to theirs. Adolescent jackals and foxes regularly stay at home to help their parents rear the next litter of cubs, and will feed and play with the young as if they were their own - even to the extent of taking over complete responsibility and successfully rearing the litter if the parents are killed. All the lionesses of a pride tend to produce their cubs at about the same time and suckle them all indiscriminately, so that a cub can get milk from its aunts or adult cousins as well as its mother. Every worker bee in a swarm is a non-breeding female which will never produce offspring of her own but helps her mother, the queen, produce more workers.

Darwin knew that his theory of natural selection should make altruism in nature impossible – certainly between species:

As in nature selection can act only through the good of the individual, including both sexes, the young, & in social animals the community, no modification can be effected in it for the advantage of other species; & if in any organism [such] could be shown to exist....it would be fatal to our theory (Stauffer 1975).

His dilemma arose because he could see clearly the conflict between the ruthless logical consequences of his own theory and the apparently altruistic behaviour of many real animals. He proposed the solution, at least for the development of altruism *within* species, that natural selection can choose between *sets* (he calls them “communities” in the quote above) of bodies carrying alternative genes. For this example, that would mean asking if populations of lions in which the new males adopted the existing cubs for the good of the species, in order to avoid wasting the food and care already invested in them, could do better than populations of lions that did not.

Darwin's acceptance of group selection went unremarked until the 1960s. But for the last 30 years the idea has been rejected, largely because it requires selection to make choices between related but separate groups of individuals of the same species. But in nature, interbreeding too easily destroys the differences between related groups, and within each group, individual self-interest is nearly always stronger and more effective than group interest. Only if all members of a group share the same fate - like the genes within a body, or the rowers within a crew - does selection shift up to the next level (Wilson 1997b). Genetic selection at the group level in nature usually does not work because nature so rarely provides the conditions for competition between genetically defined members of a metapopulation* – the natural equivalents of the football league.

3.2 Altruism: kin selection

Opponents of the evolutionary interpretation of nature like to point to examples of “natural” altruism, such as the co-operative lionesses and jackals, as proofs that science is quite wrong - that nature was, as Genesis asserts, created good as well as beautiful, and it was only human greed and disobedience that has spoiled it.

On the contrary, these examples of animal altruism confirm the modern synthesis as outlined above: they are all cases of kin selection, which still obeys the universal

principle, “look after number one”. The difference is that here, the “number one” being looked after is the gene, not the body it happens to be in for this generation. It works because of the crucial difference between the genes and the bodies they inhabit.

Kin selection is a simple modification of natural selection. It relies on the initially counter-intuitive fact that, in the calculus of evolution, reproductive success can be as well be achieved by proxy as by producing young of one’s own. If animals are related, they share copies of the genes they inherited from their common parents. Relatedness reduces the extent of competition and increases the chances of co-operation. In mammals and birds, parents and their offspring share 50% of their genes, and so do full siblings. Any altruistic act by one individual that benefits a related one will increase the chances of some copies of the genes they share reaching the next generation, even if the altruistic individual is disadvantaged personally. Since all the lionesses in a pride are related to each other, all the cubs carry copies of the females’ genes, and it scarcely matters who feeds which. Maiden aunts who help their sisters rear young at the cost of their own family prospects are still serving the interests of the genes they all carry. This apparently altruistic action contributes to the “inclusive fitness” of the aunt, and can be favoured by natural selection. Likewise, the young jackals that babysit their infant siblings are doing more to further the interests of their own genes than if they left home. Jackal cubs reared by several adults have far more chance of surviving than those reared by solo pairs, and all carry copies of the altruists’ genes.

The most spectacular examples of kin selection are the Hymenoptera (the sociable bees and ants), but that is because they have a peculiar genetic system, completely unlike that of humans. Worker bees share *more* genes with their siblings than they would with their own young, so their genes would be positively penalised if all the workers decided to go it alone. The self-sacrifice of worker bees should not be held up as an example to people, since the mathematics of relationships argue against the emulation of the ants’ unconscious altruism being developed on the same scale by any human society.

If the theory of kin selection is true, the degree of co-operation between individuals in all species capable of recognising who their relatives are should depend directly on the degree of relatedness. The highest relatedness possible, in all species except the hymenopterans, is the 50% between a parent and its offspring and between siblings. The theory therefore predicts that the greatest degree of altruism is expected between these closest relatives. That is in fact what is found, and it explains many oddities in nature. Why is parental care observed much more often in females than in males?

Because in animals parental care is a good strategy only to the degree that the parent can be sure the offspring is its own (internal fertilisation and long gestation mean that, at least in mammals, maternity is a matter of fact, paternity is a matter of opinion). Why does a male lion have a better chance of joining a pride if it has a brother? Because the coalitions between males that are often necessary to take over a pride are best formed by brothers. This process of favouring relatives at the apparent (but not real) cost to one's own genetic inheritance, so far from disproving the neo-Darwinian view of nature, has proved to be one of the most spectacularly successful explanations of a wide range of hitherto inexplicable observations.

The theory of kin selection also allows remarkably detailed analyses of parental investment among animals. The mother bear who defends her cubs against a marauding puma is in fact serving the purposes of her genes and the copies of them that the cubs already carry. On the other hand, if her altruistic action costs her her life, she is giving up the chance of producing more cubs in the future. Each litter of cubs demands an investment of time and energy by the mother, which reduces her chances of producing another litter in the future. Mother animals tend to invest just as much in each batch of young as they need to have a fighting chance of survival, but not more, since any surplus maternal effort would be better saved for a future litter. So when the young of one litter are old enough to fend for themselves, the mother bear evicts them and starts on the next lot. Since every cub shares half the mother's genes, they share some of her interests and usually go after only minimal resistance, although the half of their genes that are not shared with the mother favour the cub's efforts to persuade her to let it stay a bit longer. The interplay between co-operation and competition places limits to altruism in nature, which can be calculated from the degree of relationship and the life expectancy of the particular interacting individuals. The point of balance is achieved in retrospect and quite unconsciously by natural selection, in its constant work of distinguishing the fit from the unfit genes.

Sibling chicks of many birds, such as raptors and pelicans, are graded by size; the older ones generally gang up on the smallest, which seldom survives unless food is very abundant⁵⁸. Newborn hyenas come into the world equipped with eyes already open, teeth already erupted and awesome tempers; they fight each other almost as soon as they are out of the placental membranes. Paradoxically, the explanation for disharmony between siblings of some species is the same as that for the helpful

⁵⁸ This observation causes anguish to theologians (McDaniel 1989) but is not incompatible with authentic Christian creation theology (S. 8.2).

nature of the siblings of other species such as jackals: siblings share half each other's genes. The half they have in common favours the tendency to help each other; the half that is different favours ruthless competition, especially for the food and other resources provided by the mother. Which tendency dominates depends on the evolutionary history of the species and the circumstances of the time, especially the distribution, size and supply of food.

3.3 Altruism: reciprocity

Not all altruism is driven by kinship, in either the animal or the human worlds. Kin selection is certainly a powerful basis for apparently unselfish behaviour in family groups, but reciprocal altruism provides another mechanism that operates in groups of unrelated individuals. The main difference is that the predictability of the expected benefit depends not on relatedness, as in kin selection, but on the probability of reciprocation. In turn that depends on memory capacity, permanence of association and other characters unaffected by relatedness.

It is particularly clear in intelligent animals that have good memories and extensive social relationships, such as the social carnivores (Macdonald 1983). In meerkats and dwarf mongooses, the adult members of a pack are not necessarily related, but they take turns to look out for predators while the rest of the pack feeds. As all the infants in the group are the offspring of only the dominant pair, many adults have to put their own parental aspirations on hold, and some never get the chance to breed at all. But the subordinates cannot survive long outside a pack in which mutual defence against predators gives an individual enough time to forage for itself, so they tolerate subordination within a pack as being a better strategy than the likely alternative, death outside one. They will be well placed to compete for the top spot when it next falls vacant, and in the meantime they work diligently to gain valuable experience in parenting skills.

Reciprocity extends altruism outside the family. It allows a cohesive social structure in groups including non-relatives, provided each individual is able to recognise other individuals and remember past favours. It works so long as A, having benefited from B's help today, is willing to help B tomorrow. In a small group where all individuals know each other and have sufficient memory - that is, in many of the higher mammals and all pre-humans and humans - the problem is to avoid exploitation by cheats who gain now but refuse to reciprocate later. B must remember A's debt and retaliate if A refuses to

pay it, by refusing further co-operation or by active aggression. For example, the benefit conveyed by one chimp that grooms another troubled with parasites easily exceeds the cost of the action. Therefore, grooming alliances in primates are easily established, and are very important means of reinforcing the bonds of friendship between certain individuals, as well as the rules of reciprocity among all members of the group. But cheaters become well known, and have difficulty in finding a grooming partner when they need one. Social rejection of cheaters is one of the most powerful means by which sociable animals maintain systems of reciprocal altruism, and the extension of that mechanism into human life underpins many of our social attitudes, such as disapproval of those who attempt to “free-ride” on buses, or fail to return dinner invitations or write thank-you letters (Appendix Table 2).

3.4 Altruism: multi-level and group selection

Organisms are composed of subunits, including genes, and are themselves subunits of larger entities such as social groups. A recent extension of natural selection theory sees it as a multi-level process that operates on a nested hierarchy of units (Wilson 1997b). When all the members of a group have the same fitness and a shared fate (like all the organs of one body, or the eight members of a rowing crew), they lose their individuality and are treated as subunits of a larger whole. Because selection chooses only between organisms – that is, units differing in fitness - it can only treat each organ or rower as similar sub-units of a larger unit. It has to shift up a level until it can choose between separate bodies, or boats, that have different fitness and are in direct competition.

The normal definition of an organism is the individual animal, but since an organism is defined by *relative fitness*, the concept can be frame-shifted up or down from the individual level. When genes differ in fitness, they become competing organisms and the individual body is their environment. “Outlaw” or “rogue” genes occasionally appear, which have effects favouring their own propagation at the expense of the integration of the whole body (Dugatkin et al. 1994). They are normally counteracted by “the parliament of genes” which suppresses the outlaws and enforces the co-adaptation of all the units of the genome. The same applies to somatic cells: cancer develops when normal cells escape the control over growth and differentiation exerted by the genes, and begin to multiply at the expense of the rest of the body.

At the other end of the scale, in a colony of ants, each individual ant is an organ, a subunit, of a genetically defined organism, a colony, which is in competition with other such organisms. This arrangement means therefore, the eusocial insects are among the very few examples in nature of genetic selection at the group level. In humans, altruism at the group level is very important, but controlled largely by cultural, not genetic, mechanisms (S.6.3).

APPENDIX 3: BIOTHEOLOGY AND CHRISTIAN DOCTRINE

The Biblical writers got many things right about human nature, but one of the most important of the things they got wrong was the idea that human life is quite different from, and separate from, the rest of nature. On the contrary, there is a seamless continuity in selection processes from nature through secular society to religion. Animal life, human life and scripture are full of examples, operating both at the individual level (as natural selection favouring personal self-interest) and as cultural group selection (favouring various forms of inter-group conflict and xenophobia).

In nature and in secular human life, the effects of individual selection are not always automatically damaging – they can range from a direct benefit to the community or to one's own kind, through no effect, to direct damage (Text Table 1). However, competition for individual advantage among animals is real and ruthless, as are commercial competition and religious wars among humans, and they have much in common. For example, gestures of reverence or appeal by a supplicant before superior authority are powerful because they have their origin in animal signals. Kneeling with head bent makes the supplicant smaller and less threatening, averts the gaze and exposes a vulnerable area (as to the axe) - much as submissive juvenile wolves grovel before their pack leader, with their tails and eyes averted and their throats exposed to his teeth.

In nature there is nothing to prevent individuals from pursuing their own advantage to the detriment of the wider group to which they belong, if the individual advantage is strong enough. For example, the personal benefit conferred by any character that dramatically increases mating success (such as the huge antlers of the male Irish elk) cannot be over-ruled by any species-level consideration. Unless some long term limit (perhaps set by ecological constraints) becomes stronger, extinction is the likely result of such a conflict. On the other hand, kin selection and reciprocal altruism can transform individual advantage into an entirely constructive force, although always with strings attached.

1 Jesus' teaching

During his earthly ministry Jesus commented on many aspects of the socially-acceptable forms of natural and cultural selection he saw all around him. Biotheology shows that many of them had their roots either in the Old Testament, or, further back, in the natural world (see Scripture references in Appendix Table 2). His standard was always higher than the old, and his responses always emphasised the over-ruling of self-interest which is possible only with the faith by which he lived himself. His teaching exposes the universal compromise with the world which ancient Judaism (and, still more so, institutional Christianity) has tended to condone in order to ensure corporate survival.

For example, he pointed out that displays of fashion and military strength, similar in principle from flowers to Solomon and from birdsong to Goliath, do not ultimately achieve what people really want; neither does wealth, for which the rich fool fought with as much tenacity as rats at the tip, since he did not have what money cannot buy, a son. Rivalry between siblings did not start with Cain and Abel, since the strongest chicks of hawks and pelicans (McDaniel 1989) always kill or evict the weakest. Uninhibited aggression (living by the sword) is a bad policy, better avoided by graded assessment signals that prevent fights except between equals, especially in well-armed animals such as red deer.

Jesus extended the Mosaic prohibition of murder to the nursing of anger which may lead to it. The stoning of adulterous women is merely a human extension of various techniques long established by nature to protect a cuckolded male from perpetuating someone else's genes; but Jesus advocated forgiveness and acceptance, on the grounds that a woman's life is worth more than the biological self-interest of her husband. The pack hierarchy of social animals such as wolves is well represented in human life, and Jesus even had to rebuke his own disciples for it. He over-ruled the universal antipathy against parasites and social bludgers of all kinds with the simple command to love one another. He extended the family-limited natural altruism of kin selection to everyone, on the grounds that anyone who loves God is family. He did the same for the only other basis for unselfishness possible in unredeemed nature, reciprocal altruism, by exposing the inadequacy of the Golden Rule: what good is it if you love only those who love you, since even the scum of the earth (such as the tax-gatherers) do as much? He answered the greatest moral question of all, "and who is my neighbour?" by over-ruling the ancient tribal rivalry between groups and extending

normal within-group altruism to all humans. And finally, for anyone who still thought that "natural" human decency (ie, reciprocal altruism, as shaped by cultural selection and exemplified by the Ten Commandments) is enough to please God, Jesus corrected them with the chilling reminder that "no-one is worthy of me who does not take up his cross and walk in my footsteps" (Mark 8:34).

The one thing we never find in the natural world, and only rarely in ordinary human life, is complete and total abandonment of self-interest - that is, purely disinterested altruism, with no payoffs either in descendants or in reciprocated co-operation. Even in the Bible, it is uncommon: Abraham was willing, although he was offered a ram in a thicket at the last minute (Gen 22:13). For Christians, the only perfect example is Jesus. Darwinian biology helps to explain, for our culture (or at least, the scientifically informed parts of it) not only the evolved basis of "ordinary" morality, as explained above (S.6.6.3), but also why *only* the Christ of faith could go so far beyond it.

Part of the reason why the early church was driven to develop its progressively more profound doctrines of christology must surely have been the conviction that no one could be as good as Jesus evidently was, and abandon all self-interest as he did, unless he was completely unique in human history. At first, Jesus' supreme relationship with God was seen as evidence that he was a very special man (in later terminology, a new mutation of humanity (Theissen 1984)), who was somehow enabled to place his entire trust in God to an extent never achieved before or since. But that view could not fully account for the impact of the risen Christ in the life and experience of his followers, so - amazingly for strictly monotheistic Jews - they eventually concluded that the Jesus of history must have been also God. Spiritually aware people have struggled ever since to answer the same question Jesus asked them - who do you say that I am? The answers have reflected the values, concerns and faith of every age, because the Christ of faith is a product of theological intention (Pratt 1987:13).

2 Original sin

Traditional theology has always made a distinction between original sin as an inescapable predisposition which "contaminates our lives from birth" (McGrath 1994:374), and personal sin as an individual, deliberate act. If original sin is equated with the conflict (Fig 3) between natural selection for individual advantage and cultural selection for group advantage (Campbell 1975), which is inherent in human nature,

then it certainly is an inescapable predisposition. We may know very well that there are good reasons why we should be honest, chaste, sober, hardworking, faithful and public-spirited in this life, if only in the hope of being happy in the next, yet somehow it is never as easy as that. St Paul hit the nail right on the head:

...when I want to do the right, only the wrong is in my reach. In my inmost self I delight in the law of God, but...there is in my bodily members a different law, fighting against the law that my reason approves....miserable creature that I am, who is there to rescue me out of this body doomed to death? (Rom.7:21-24).

Paul could hardly have written a better description of the inner conflicts generated by the meeting of our animal and cultural heritages if he had been schooled in evolutionary biology. Even more clearly, he summarises the distinction between natural and group selection, and the divine abandonment of all selection, during his chastisement of the Corinthians for the dissent within their church. "While there is jealousy and strife among you, are you not of the flesh and behaving like ordinary men?" (1 Cor 3:3) - in other words, they were still under the influence of their unredeemed human natures. On the contrary, he urged them, "let no-one boast of men....you are Christ's and Christ is God's" - that is, they must remember that they had died to natural selection at their baptism, and had now passed through group cultural selection ("you are Christ's") to grace ("and Christ is God's", ie *no* selection now operates on you).

The ancient distinction between the concept of original sin, a general predisposition, and immorality, individual acts of wrongdoing (McGrath 1994:374) is consistent with biology. The first refers to what we *are* (any species that has survived the winnowing processes of natural selection must necessarily have equipped its members to be self-centred in some sense), the second to what we *do* - how we make those choices between self-interest and group interest. Sociable animals are not so much "survival machines" built by selfish genes (Dawkins 1989) as "adaptive decision-makers" (de Waal 1996:18). The assumption that human nature is malleable by culture and circumstances, to produce altruistic or individualistic behaviour (usually equated with good or evil, respectively) according to the odds on whatever strategy might pay best in the social environment of the moment, helps to explain the origin of sin. Indeed, one helpful modern definition of sin is simply the breakdown of relationships (Barbour 1997).

On the other hand, Augustine's elaboration of the Eden story in pursuit of the doctrine of original sin involved some completely invalid reasoning. His insistence that Adam's sin introduced death to a humanity previously free of it was preposterous:

To claim that a single human will ever possessed such power reflects a presumption of supernatural human importance. When Augustine claims that a single act of Adam's will changed the structure of the universe itself, he denies that we confront in our mortality a natural order beyond human power (Pagels 1988: 144-5).

Actually, Augustine did not claim that the whole universe was corrupted, only the human capacity for moral judgement (Kaiser 1996). According to Santmire (1985: 66) Augustine denied that the Fall affected wild nature, which he regarded as full of radiant beauty, portraying the transcendent and fecund glory of God. If the humanised parts of creation made life difficult for humans, that was only because it was obeying God's command to punish Adam's descendants. The idea of transmitted guilt affecting nature was totally absent from the Patristic tradition (McGrath 1994:371); the extension of it to the whole cosmos was a consequence of the adoption of Aristotelian cosmology into theology by Aquinas in the thirteenth century. But to the people of Augustine's time, the human and natural worlds were practically the same. The distinction between them is relevant to modern considerations of the relationship between theology and modern conservation biology, but not to Pagels' historically-oriented question: why did Catholic Christianity adopt such a paradoxical doctrine, in the teeth of opposition from other theologians and in the face of all ordinary reason? Her answer illustrates the power of self-interest at the corporate level, which, as biotheology predicts, is capable of subverting the motives of even the most idealistic organisations:

Such beliefs validate the church's authority, for if the human condition is a disease, Catholic Christianity, acting as the Good Physician, offers the spiritual medication and the discipline that alone can cure it (ibid p. 145).

On the other hand, if Augustinian theology served only as a device for social manipulation, why would reasonable people accept such sophistry? Pagels points out that from ancient times until now, and independently of any religious belief, the most common immediate reaction of anyone suffering some sort of disaster is to ask what they had done to deserve it. There seems to be a strong and almost irrational human tendency to accept blame for natural misfortune, and it is certainly not confined to the

early Christian church, nor to the unpleasant personal consequences of individual bad moral decisions. The Jews of Jesus' time were ready to believe that the eighteen unfortunate people killed by the fall of a tower in Siloam must have been worse sinners than those who escaped (Luke 13:1-5). Pagels suggests that people need to find a *reason* for their sufferings, so,

Had Augustine's theory not met such a need - were it not that people often *would rather feel guilty than helpless* - I suspect that the idea of original sin would not have survived the fifth century (Pagels 1988: 147, author's emphasis).

Augustine taught that natural events are not random, but lie within the moral sphere, and so potentially within human control. The rival theory of Julian and his many supporters offered less prospect of human control over nature. The illusion of control came at the price of personal and corporate guilt, but - as history shows, and biotheology affirms - the desire for power and its associated privileges is among the most powerful default settings of human nature.

3 Baptism

Terrestrial animals fear drowning, and most humans have a panic reaction to having their heads forcibly shoved under water. The traditional practice of baptism by total immersion and rising from death to a new life is therefore a powerful symbol of the theological doctrine of Christian faith as death to our natural life and the beginning of a new life in Christ. It also answers the question often raised by critics of the practice of infant baptism, that infants do not need redemption before they have had the opportunity to commit sin.

Just by being human and sharing in the human genetic and cultural heritage, infants share the same predispositions as all the rest of us, so to the extent that baptism cancels original sin, we all need it, infants included. This interpretation assumes that the sacraments generally are causative rather than declarative (McGrath 1994:446). If baptism is understood as causative (it effects forgiveness) it is perfectly appropriate to apply to infants; if it is understood as declarative (it demonstrates forgiveness), it is not. The difference between the two has been argued at length by theologians; in general, the Anglo-Catholic tradition (and biotheology) seems to opt for the first, and various other Protestant communities for the second. Sociobiology

makes clear that human nature cannot redeem itself; God must act first and rescue us while we are still sinners, for without rescue we remain in that state, but then it is atonement that transforms human nature, rather than a transformed nature effecting atonement (Williams 1998).

4 Predestination

This contentious doctrine developed over centuries in response to the ancient question of why not everyone has faith. The customary answer was that faith is a grace, and grace is a gift, not a reward. If it were a reward, people could claim a right to it; they could earn it by their virtue, which would place God under an intolerable obligation to humans. But according to Augustine, all humanity is contaminated by original sin, and unable to escape from its grasp. Only grace can set people free, and yet grace is apparently granted only to certain individuals, which presumably means that the rest must be condemned even while they live. At first sight this doctrine seems to accord well with the genetic determinism which is often detected behind the sociobiological agenda (S.6.6.2), but there are two serious objections to it.

First, the clear message of Scripture is that God's standards are far too high for anyone to meet, so *no-one* could possibly earn salvation (Appendix Table 2); the idea that humans could ever become virtuous enough to demand it by right, due largely to Pelagius (McGrath 1994: 23), is complete nonsense. Second, Jesus made it abundantly clear that *everyone* is offered salvation regardless of their inability to qualify for it; all they have to do is to accept the free grace that he offers (Williams 1998). Biotheology agrees that no-one can qualify, in the sense of being able to meet the minimum selection criteria, but Thiessen (1984) points out that the central message of the gospels is that God has abandoned the whole idea of selection criteria, so everyone who chooses to accept Jesus' offer can be, like the penitent thief, with him in Paradise the same day. As Paul put it to the Romans, God loved and accepted us while we were yet sinners – yes, and biotheology adds, not only while we were personal, human sinners, but also since long before our ancestors had emerged from our animal ancestry. Biotheology would agree that predestination and genetic determinism both miss the point: the sustaining love of the Father, the self-offering love of the Son and the energising love of the Holy Spirit cannot be constrained within the limits of human logic.

5 The Body of Christ

Paul's famous image of the body of Christ, in which all members work together at their different skills for the common good, is another image given greater depth by biotheology. The bodies of multicellular animals are all derived by sequential division of a single fertilised egg, and all their cells (except a few specialised components of the immune system, and somatic cells damaged by mutation with age) have exactly the same set of genes. There can be no competition between genetically identical units, and so perfect co-operation is assured (Maynard Smith and Szathmary 1995).

Paul urges the Corinthians to co-operate with each other in the same way, since they are (metaphorically) parts of the Body of Christ. But human individuals are not all genetically identical like the cells of a real body, so despite their best efforts, humans simply cannot escape genetic rivalry; they can never achieve a state of "no discord" (1 Cor 15:25), not even when supported by God's abundant grace, as church history amply demonstrates. Paul's is a counsel of perfection for the Church militant, although it will no doubt will apply in full measure to the fully redeemed members of the Church triumphant.

6 Heaven and hell

Millions of years of reciprocal altruism have engendered in humanity a powerful nose for justice. The automatic keeping of scores was at first useful mainly for avoiding exploitation within social groups, but in due course it was applied to the apparently intractable problems of undeserved suffering in general. This question became particularly acute for the Hebrew culture, which believed that prosperity was a sign of divine approval. In Deut 30:15-20, God's conditional promise of salvation for the obedient was in effect a charter for group selection:

If you [plural] obey the commandments of the Lord your God...then you shall live and multiply....But if your heart turns away.....you shall perish; you shall not live long in the land...therefore choose life, that you and your descendants may live.

Inevitably, competition for personal advantage among the powerful was incompatible with group selection among the people. It seems that, just as the failings of the Davidic lineage led to the concept of a supernatural Messiah (S.9.5), so the obvious injustices of earthly life led to the concept of compensatory justice in the next life. So, Buechner (1973) defined Christianity as “mainly wishful thinking. Even the part about Judgement and Hell reflects the wish that somewhere the score is being kept”.

7 The reality of God

Hard-nosed reductionists have no trouble accepting the reality of the genetic code as an immaterial reality in the codical domain, whose sole function is the self-replication and communication of information. Genes do not themselves fight, play, reproduce or care for their young, but they perpetually transmit the instructions for making bodies that do. Genes have no power to coerce their creations to follow their instructions, because genetic information is useless alone; it can work only by interaction with the material environment (and, among higher animals, with choice); but too-drastic modifications are usually painful or at least unhelpful. Nevertheless genes appear to be relatively immortal and powerful, so hard-line reductionists such as Dawkins assign the genetic code greater long-term value than that of the temporary material bodies that carry the code down the generations (S.6.6.2).

I see no difference in principle between that and Polkinghorne’s concept of God as an immaterial communicator of instructions and loving acceptance, a reality in the codical domain – *in short, a Word*. God does not normally directly intervene in human affairs, but routinely creates and upholds the conditions for making the human beings that do. God either does not have power to coerce creation to follow the divine instructions, or else chooses not to use it, but too-drastic modifications of them are usually painful or at least unhelpful. Traditional theology naturally assigns to God greater value than to the creation.

8 The role of women in history and the virgin birth

Modern genetics casts new light on ancient questions about age, sex and death. The three of them constitute an alliance, all derived from errors in copying the genes - the process that causes individual bodies to decay but the genetic message to be

preserved. Senility is caused by cumulative copying errors in the mitochondria of the body cells, which reduce energy production; also, many inherited diseases appear in later life as bad side-effects linked to reproductive advantages to the young. But the cells that later become sperm and eggs are set aside, separate from the rest of the body, from well before birth. During the processes of sexual reproduction, which compare and re-match the two separate copies of each gene drawn by the two partners from the species genepool, many errors are found and deleted. Indeed, one of the main tasks of sex is to undo the damage done by mutation to the body of every prospective parent during its own growth years – in other words, sex functions for mutual proofreading of genes. Jones (1996) therefore draws a parallel between mutation in the “corruptible body”, and the life-giving effects of sex and resurrection.

The story of mutation unites, as nothing else, scientific and spiritual views of the human condition. It gives the idea of resurrection “ a corruptible body raised in incorruption” – a new and precise meaning (Jones 1996:247).

A woman makes her full complement of around a million egg cells before she is born, and releases them at intervals throughout her reproductive life. A man makes millions upon millions of sperm cells every day. Since the sperm are made at a vastly greater rate, the mutation rate is higher in them, whereas in ova the self-checking processes operated by armies of repair enzymes are slower and can be more comprehensive. Hence, says Jones, the conventional [Augustinian] idea of women as the source of corruption is wrong; by this definition, women are the essence of resurrection (ibid p. 277).

The virgin birth, too, needs rethinking in the light of biotheology, and not for the obvious reason that only a girl could be produced by a parthenogenetic birth. If Jesus was truly fully human, as the patristic Church insisted, he must have been not only bone of our bone but also (in modern terms) DNA of our DNA. He must have had a Y chromosome complete with all the genes that define masculinity and which connected him to our earliest human ancestors via the immense span of historical linkages that determine the male part of the evolved human condition. As Gregory of Nazianus (329-89 CE) put it, “what he has not assumed he has not healed” – so it is *theologically necessary* that the birth narratives be seen as legend – as conveying truth, without being factual. For both biological and theological reasons, the doctrines of the virginal conception and of the incarnation are different, and must be separated (Peacocke 1995). Gregory himself would have approved this development, since he recognised the evolutionary nature of theology:

By gradual advances and ...partial ascents, we should move forward and increase in clarity, so that the light of the Trinity should shine (quoted by McGrath 1994:244).

9 The apocalypse

The persistent Biblical notion of an imminent punitive judgement on the whole world which we can escape only by radically changing our behaviour reflected an intuition that science now confirms all too clearly (Theissen 1984:113). Cultural evolution cannot proceed in the wrong direction for long, and if we insist on living in ways incompatible with the basic conditions of our existence, we will end by destroying our environment, and the consequences will be automatic, just as the Old Testament prophets proclaimed.

APPENDIX 4: SOME ORGANISATIONS SUPPLYING INFORMATION RELEVANT TO THE FIFTH MISSION STATEMENT

UK and Europe

Christians in Science: 88 Sylvandale, Welwyn Garden City, Herts AL7 2HT.

The Institute for Contemporary Christianity: Christian Impact, St Peter's Church, Vere St, London W1M 9HP.

The John Ray Initiative: 5 Chancery Lane, Clifford's Inn, London EC4 1BU.

The Religious Education and Environment Programme: Rodwell House, Middlesex St, London E1 7HJ.

Real World Coalition: 17 Carlton House Terrace, London SW1 (realw@clara.net).

Science and Religion Forum: St Alban's Vicarage, Mercer Ave, Coventry CV2 4PQ.

World Council of Churches, Programme Unit III - Justice, Peace and Creation: PO Box 2100, 1211 Geneva 2, Switzerland.

USA

Center for Theology and the Natural Sciences: 2400 Ridge Road, Berkeley CA 94709.

Institute for Religion in an Age of Science: PO Box 341, Quakertown NJ 08868-0341.

National Religious Partnership for the Environment: 1047 Amsterdam Ave., New York 10025 (www.npre.org).

Appendix 4

Science and Spirit Resources Inc: 171 Rumford St, Concord NH 03301-4579.

United Nations Environment Programme: DC2-0803 United Nations, New York NY 10017.

New Zealand

The Natural Step Environmental Foundation, Aotearoa New Zealand: 8 Coolidge St, Brooklyn, Wellington (tns@naturalstep.org).

GLOSSARY

Allele One of a pair or more of genes at the same locus.

Atavism An ancestral character not usually observed in modern animals.

BSR , Board for Social Responsibility Administrative unit at Church House, London, the central offices of the Church of England, concerned with, among other things, environmental issues.

Character displacement If two similar species avoid competition by developing distinct differences in, say, size or diet, those differences tend to be more pronounced where the two species live in the same area than when they live apart.

Church Used with a capital letter in the present context, this means the Anglican Church, especially the Church of England and the Church of the Province of New Zealand. This usage is not a value judgement on any other church, but merely an acknowledgement that it was St John's College Trust (Auckland) that funded my research and has first call on the results, and that I did much of the writing while on sabbatical in Oxford. Used without a capital, it means the Christian church in general. Full ecumenical relevance is assumed throughout, not only to other Christian denominations but also to the major non-Christian faiths as well. As Hall (1986:41) put it, "there can be no responsible theology now that is not global in its perspective". However, ecumenism does not require heterodoxy or uncontrolled eclectism, an unfortunate outcome of the Assisi Declarations (Berry 1995).

Critical realism The view that reality precedes theorising, which in turn implies that the real world must place distinct limits on theological speculation. See S. 1.6.

Default setting In a computer, the normal setting of all programme options, the basic start-up arrangement to which it always returns unless over-ruled. Used here as a metaphor for "basic" human nature.

Deism The concept of a distant and impersonal God as the Creator who made the world but then took no further interest in its workings, in contradistinction to theism, the concept of a transcendent and personal God as both Creator and constant sustainer of the world, passionately involved in all its workings.

Diploid The condition of having paired chromosomes.

EFM Education for Ministry, a four-year theological study programme for lay people.

Ethology Study of the evolution and adaptive functions of animal behaviour.

Epigenesis Theory that the embryo is formed by successive changes in structure.

Eukaryotic cell Cells whose DNA is organised into chromosomes with a protein coat and surrounded by a nuclear membrane.

Evolutionary egoism Self-interest at the genetic level, not involving personal choices by an individual.

Evolutionary psychology A more recent and less political version of sociobiology (qv)

Fallacy of misplaced concreteness The tendency to organise knowledge in terms of abstractions and then to reach conclusions and apply them to the real world as if abstractions and reality are the same thing.

Hierarchy A system of rank order among social animals, including humans. Also, metaphorically, the system of levels of organisation of the sciences (see *reductionism*).

Incarnation The doctrine affirming that the divine nature of God assumed human nature in Christ.

Integrity of creation See variety of definitions discussed in S.8.4.

IRAS Institute for Religion in an Age of Science (address in Appendix 4).

JPIC The Justice, Peace and Integrity of Creation programme (JPIC) of the World Council of Churches (WCC), now called Unit III, Theology of Life, based in Geneva.

Kin selection A theory explaining the evolution of altruism among animals. The actions of one animal that benefit the breeding success of its relatives at the cost of its own can favour the genes they have in common, and thereby the altruist's genes will be passed to the next generation even if it does not itself breed. It predicts that the degree of co-operation between individuals, in all species capable of recognising who their relatives are, will depend directly on the degree of their relatedness.

Macrophase wisdom Term used by Brian Swimme to indicate the potential human ability, much-needed in the modern world by not nearly common enough yet, to make decisions transcending the evolved imperatives of our ancestral tribal groups.

Maximum sustainable yield The cropping rate that will produce the largest possible harvest of individuals without reducing the standing crop or the future productivity of the population.

Meiosis (Reduction division) A form of cell division, found only in the sex cells, in which copies of the paired (diploid) parental chromosomes are split into single strands and separated in the daughter cells.

Meiotic sex Sexual reproduction involving meiosis, in which each partner produces gametes (eggs or sperm) each carrying only a single chromosome. At fertilisation, the single-strand chromosomes pair up again, restoring the diploid condition. The process of pairing up allows mutual cross-checking for copying errors.

Metapopulation An aggregate of several separate interbreeding populations which together hold the species total or local gene pool.

Microphase wisdom Term used by Brian Swimme for the evolved minds and attitudes of our early ancestors, adapted to tribal-level rather than global-level politics.

Multi-level selection theory Recognition that natural selection works on a nested hierarchy of units, from genes through organisms to groups. Selection distinguishes between sets of units that compete with other sets, but does not distinguish between units within a set that all share the same fate.

Myth A narrative elaboration of culturally shared perceptions of reality, historically always the template for the derivation of moral values (Rue 1989).

Naturalistic fallacy GE Moore's term for the attempt to define goodness from natural properties (Honderich 1995:606)

Non-zero-sum games See zero-sum games

North Current euphemism for the "developed" world regardless of location, including New Zealand. By analogy, the term may be extended to individuals among the Southern social elites who have adopted the pursuit of growth economics.

Reciprocity A process of holding social groups together by reciprocal altruism, or the trading of favours.

Reductionism The natural world is a hierarchy of levels of organisation, increasing in complexity from physics through chemistry to biology. Reductionism aims to understand each level by breaking it down into component parts that can be analysed in terms of the level below it. "Hard-line" reductionists claim that all biology can be explained in terms of chemistry, and ultimately, physics; no other explanations are "real". Their opponents point out that many features of the higher levels of organisation are non-reducible emergents. They cannot be understood at all except in terms of concepts appropriate to that level, and there is no reason to suppose atoms are more "real" than a person or a social fact (Peacocke 1993: 39-41).

RWC Real World Coalition, an association of independent organisations concerned with environmental and social issues, based in London.

Religion - See S.1.3.1

Science See S 1.3.1

Selection Differential survival of self-replicating biological or cultural units between one generation and the next. *Kin selection* discriminates between genes, *natural selection* between individuals, and *group selection* between isolated populations. All three apply to humans, but only the first two to animals and plants.

Sociobiology Study of the evolutionary background and adaptive functions of social behaviour in animals and humans.

South Current euphemism for the "under-developed" world regardless of location, including certain groups within the North who are disadvantaged by growth economics. Preferred by some writers to the older term "Third World", which, in terms of numbers of people, would more accurately be called the "Two-thirds World".

Sustainable development Development which meets the needs of the present without compromising the ability of future generations to meet their own needs (Bruntland 1987).

Symbiosis Co-habitation of entities that are not genetically identical.

Theism See Deism.

Theology As defined by (Ambler 1990): serious intellectual enquiry into matters of spiritual concern. See S 1.3.1.

Tikanga The New Zealand Anglican Church is divided into three parallel tikanga or streams of tradition, expressing the different cultural heritages of European, Maori and Polynesian peoples.

UNCED United Nations Conference on Environment and Development, held at Rio de Janeiro in June 1992, also known as the Earth Summit.

Vernacular egoism Personal selfishness, the consequences of conscious choices made by the individual.

Zero-sum game A game in which one side must win and the other side must lose, such as almost all high-profile competitive sports. Contrast with **Non-zero-sum** games, systems of co-operation in which *both* sides win, and the more they co-operate the greater the rewards, such as most social interactions

REFERENCES

- Alexander, R. D. 1987. *The Biology of Moral Systems*. New York: Aldine de Gruyter.
- Allaby, M. 1977. *A Dictionary of the Environment*. London: MacMillan Press.
- Ambler, R. 1990. *Global Theology: The meaning of faith in the present world crisis*. London: SCM Press.
- Anglican Church. 1989. *A New Zealand Prayer Book*. Rotorua: Collins.
- Anon. 1970. *Man in his Living Environment*. London: Church Assembly Board for Social Responsibility.
- Anon. 1990a. *Justice, Peace and the Integrity of Creation in Aotearoa New Zealand*. Auckland: Conference of Churches in Aotearoa New Zealand, PO Box 9573, Newmarket AK.
- Anon. 1990b. *Mission in a broken world: Report of ACC-8 Wales 1990*. London: Anglican Consultative Council.
- Anon. 1991. *Christians and the Environment*. General Synod, Church of England, Board of Social Responsibility GS Misc. 367.
- Anon. 1994. "Putting Creation in its Place." *Creation & Environment Council, Diocese of Wellington, Workshop, Palmerston North, 26 November 1994, 1994*, pp. 67.
- Anon. 1995. Religions vow a new alliance for conservation. *One Country* 7:1, 12-14.
- Anon. 1996. *The Common Good and the Catholic Church's Social Teaching*. Catholic Bishops' Conference of England and Wales.
- Anon. 1998. *Land use control under the Resource Management Act; analysis of submissions*. NZ Ministry for the Environment, Wellington.
- Appleyard, B. 1992. *Understanding the Present: Science and the Soul of Modern Man*. London: Picador.
- Arnhart, L. 1998. The search for a Darwinian science of ethics. *Science and Spirit* 9:4-7.
- Athanasiou, T. 1996. *Slow Reckoning: The Ecology of a Divided Planet*. London: Secker and Warburg.
- Atfield, R. 1983. *The Ethics of Environmental Concern*. Oxford: Basil Blackwell.
- Atfield, R., and K. Dell. Editors. 1996. *Values, Conflict and the Environment*, Second edition. *Avebury Series in Philosophy*. Aldershot: Avebury Press.
- Austin, W. 1980. Are religious beliefs "enabling mechanisms for survival"? *Zygon* 15:193-201.

References

- Axelrod, R. 1984. *The Evolution of Co-operation*. London: Penguin Books.
- Ayala, F. J. 1998. Biology precedes, culture transcends: an evolutionist's view of human nature. *Zygon* 33:507-523.
- Bahn, P., and J. Flenley. 1992. *Easter Island, Earth Island: a message from our past for the future of our planet*. London: Thames and Hudson.
- Baker, B. 1996. A reverent approach to the natural world. *Bioscience* 46:475-478.
- Baker, J. A. 1995. Some theological questions about Christian environmental concern. *Crucible* 1995:73-84.
- Ball, I., M. Goodall, C. Palmer, and J. Reader. Editors. 1992. *The Earth Beneath: A critical guide to green theology*. London: SPCK.
- Barbour, I. G. 1972. "Attitudes toward Nature and Technology," in *Earth Might be Fair: Reflections on Ethics, Religion and Ecology*. Edited by I. G. Barbour, pp. 146-168. Englewood Cliffs, NJ: Prentice-Hall Inc.
- Barbour, I. G. 1997. *Religion and Science: historical and contemporary issues*. New York: HarperCollins.
- Barnes, R. D. 1963. *Invertebrate Zoology*. Philadelphia: WB Saunders.
- Bartholomew, D. J. 1984. *God of Chance*. London: SCM Press.
- Baxter, J. K. 1971. *Jerusalem Daybook*. Wellington: Price Milburn.
- Berry, R. J. 1991. Christianity and the Environment: Escapist mysticism or responsible stewardship. *Science and Christian Belief* 3:3-18.
- Berry, R. J. Editor. 1993a. *Environmental Dilemmas*. London: Chapman & Hall.
- Berry, R. J. 1993b. "Green religion and green science," in *Explorations in Science and Theology*. Edited by Anon, pp. 23-37. London: RSA.
- Berry, R. J. 1995. Creation and the environment. *Science and Christian Belief* 7:21-43.
- Berry, T. 1988. *The Dream of the Earth*. San Francisco: Sierra Club.
- Berry, W. 1993c. Christianity and the survival of creation. *Cross Currents* 43:149-163.
- Best, E. 1942. *Forest Lore of the Maori*. Wellington: Government Printer.
- Betzig, L. 1992. Roman polygyny. *Ethology and Sociobiology* 13:309-349.
- Birch, C., W. Eakin, and J. McDaniel. Editors. 1990. *Liberating life*. Maryknoll, NY: Orbis Books.
- Blackmore, S. 1999. *The Meme Machine*. Oxford: Oxford University Press.
- Boehm, C. 1997. Impact of the human egalitarian syndrome on Darwinian selection mechanics. *American Naturalist* 150, Supplement:S100-S121.
- Bowker, J. 1995. *Is God a virus? genes, culture and religion*. London: SPCK.
- Boyd, R., and P. J. Richerson. 1985. *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.

References

- Boyden, S. 1987. *Western Civilisation in Biological Perspective*. Oxford: Oxford University Press.
- Brennan, A. A. 1993. "Environmental decision-making," in *Ecological Dilemmas: Ethics and Decisions*. Edited by R. J. Berry, pp. 1-19. London: Chapman and Hall.
- Brown, L. R., C. Flavin, and S. Postel. 1990. "Picturing a sustainable society," in *State of the World: 1990*. Edited by L. R. Brown, pp. 174. New York: Norton.
- Brown, R. F. 1975. On the necessary imperfection of creation: Irenaeus' *Adversus Haereses* iv,38. *Scottish Journal of Theology* 28:17-25.
- Bruntland, G. H. 1987. *Our Common Future*. Oxford: Oxford University Press.
- Budiansky, S. 1995. *Nature's Keepers. The new science of nature management*. London: Weidenfeld & Nicolson.
- Buechner, F. 1973. *Wishful Thinking: a theological ABC*. New York: Harper & Row.
- Burhoe, R. W. 1970. Natural Selection and God. *Zygon* 7:30-63.
- Burhoe, R. W. 1979. Religion's role in human evolution: the missing link between ape-man's selfish genes and civilized altruism. *Zygon* 14:135-162.
- Byrne, R. 1995. *The Thinking Ape: Evolutionary Origins of Intelligence*. Oxford: Oxford University Press.
- Campbell, D. T. 1975. The conflict between social and biological evolution and the concept of original sin. *Zygon* 10:234-249.
- Campbell, J. Editor. 1970. *Myths, Dreams and Religion*. New York: E.P.Dutton.
- Campolo, T. 1992. *How to Rescue the Earth without Worshipping Nature: a Christian's Call to Save Creation*. Milton Keynes: Word (UK) Ltd.
- Capon, R. F. 1983. *Parables of Grace*. Grand Rapids, Mich.: W.B.Eerdmans.
- Capon, R. F. 1996. *The Astonished Heart*. Grand Rapids, Mich.: W.B.Eerdmans.
- Caughley, G. 1983. *The Deer Wars*. Auckland: Heinemann Publishers.
- Caughley, G., and A. Gunn. 1996. *Conservation Biology in Theory and Practice*. Cambridge, Mass: Blackwell Science.
- Cavanaugh, M. 1996. *Biotheology: A new synthesis of Science and Religion*. Lanham, MD: University Press of America.
- Chial, D. L. 1996. The ecological crisis: a survey of the WCC's recent responses. *Ecumenical Review* 48:53-61.
- Chomsky, N., and D. Barsamian. 1998. *The Common Good*. Monroe, ME: Common Courage Press.
- Christie-Murray, D. 1976. *A History of Heresy*. Oxford: Oxford University Press.
- Colinvaux, P. 1980. *The Fates of Nations: A Biological Theory of History*. London: Penguin.

- Conway Morris, S. 1998. *The Crucible of Creation: The Burgess Shale and the Rise of Animals*. Oxford: Oxford University Press.
- Crosby, A. W. 1986. *Ecological Imperialism: The Biological Expansion of Europe, 900-1900*. Cambridge: Cambridge University Press.
- Cupitt, D. 1984. *The Sea of Faith*. London: BBC.
- Daly, H. E., and J. Cobb. 1990. *For the Common Good: redirecting the economy towards community, the environment and a sustainable future*. London: Green Print (Merlin Press).
- Daly, M., and M. Wilson. 1997. "Cinderella revisited," in *Human Nature: a critical reader*. Edited by L. Beitzig, pp. 172-4. New York: Oxford University Press.
- Darwin, C. 1871. *The Descent of Man*. 1981 reprint: Princeton: Princeton University Press.
- Davidson, A. 1991. *Christianity in Aotearoa. A History of Church and Society in New Zealand*. Wellington: New Zealand Education for Ministry Board.
- Dawkins, R. 1986. *The Blind Watchmaker*. Harlow, Essex: Longman Scientific and Technical.
- Dawkins, R. 1989. *The Selfish Gene*, Second edition. Oxford: Oxford University Press.
- Dawkins, R. 1996. *Climbing Mount Improbable*. London: Viking.
- de Waal, F. 1982. *Chimpanzee Politics*. Baltimore: Johns Hopkins Press.
- de Waal, F. 1989. *Peacemaking Among Primates*. Cambridge, Mass: Harvard University Press.
- de Waal, F. 1996. *Good Natured: The Origins of Right and Wrong in Humans and Other Animals*. Cambridge, Mass: Harvard University Press.
- Dennett, D. C. 1995. *Darwin's Dangerous Idea*. New York: Simon and Schuster.
- Doty, W. G. 1986. *Mythography: The Study of Myths and Rituals*. Tuscaloosa: University of Alabama Press.
- Dugatkin, L. A., M. Mesterton-Gibbons, and A. I. Houston. 1992. Beyond the Prisoner's Dilemma: toward models to discriminate among mechanisms of co-operation in nature. *Trends in Ecology and Evolution* 7:202-205.
- Dugatkin, L. A., D. S. Wilson, L. I. I. I. Farrand, and R. T. Wilkens. 1994. Altruism, tit for tat and 'outlaw' genes. *Evolutionary Ecology* 8:431-437.
- Durham, W. 1991. *Co-evolution: genes, culture and human diversity*. Stanford, CA: Stanford University Press.
- Duyker, E. 1994. *An Officer of the Blue: Marc-Joseph Marion Dufresne, South Sea Explorer, 1724-72*. Melbourne: Melbourne University Press.

References

- Eckberg, D. L., and T. J. Blocker. 1996. Christianity, environmentalism, and the theoretical problem of fundamentalism. *Journal for the Scientific Study of Religion* 35:343-355.
- Ecologist, T. 1993. *Whose Common Future?* London: Earthscan Publications.
- Edwards, D. 1992. The integrity of creation: Catholic social teaching for an ecological age. *Pacifica* 5:182-203.
- Ehrenfeld, D. 1981. *The Arrogance of Humanism*. New York: Oxford University Press.
- Ehrlich, P. R. 1997. *A World of Wounds: Ecologists and the Human Dilemma*. Vol. 8: Ecology Institute: Excellence in Ecology.
- Ehrlich, P. R., and A. E. Ehrlich. 1996. *Betrayal of Science and Reason: How anti-environmental rhetoric threatens our future*. Washington DC: Island Press.
- Eldredge, N. 1995. *Reinventing Darwin: the great evolutionary debate*. London: Weidenfeld and Nicolson.
- Elliott, H. 1997. A general statement of the Tragedy of the Commons. *Population and Environment* 18:515-531.
- Elton, C. S. 1958. *The Ecology of Invasions by Animals and Plants*. London: Methuen & Co.
- Evernden, N. 1992. *The Social Creation of Nature*. Baltimore: Johns Hopkins University Press.
- Flannery, T. 1994. *The Future Eaters*. Port Melbourne: Reed Books.
- Fleming, C. A. 1962. History of the New Zealand land bird fauna. *Notornis* 9:270-274.
- Foley, R. A. 1996. "An evolutionary and chronological framework for human social behaviour," in *Evolution of social behaviour patterns in primates and man*. Edited by W. Runciman, J. Maynard Smith, and R. Dunbar, pp. 297. Oxford: The British Academy and Oxford University Press.
- Friends of the Earth Europe. 1995. *Towards Sustainable Europe*. Brussels: Friends of the Earth Europe.
- Galbraith, J. K. 1992. *The Culture of Contentment*. London: Penguin.
- Galbraith, J. K. 1996. *The Good Society*. London: Reed International Books.
- Galbreath, R. 1989. *Walter Buller, The Reluctant Conservationist*. Wellington: GP books.
- Galleni, L. 1992. Relationships between scientific analysis and the world view of Pierre Teilhard de Chardin. *Zygon* 27:153-166.
- Galvin, R., and R. Kearns. Editors. 1989. *Repainting the Rainbow: ecology and Christian living*. Auckland: Christian Ecology Group and Maclaurin Chaplaincy, University of Auckland.

References

- Ganoczy, A. 1991. "Ecological perspectives in the Christian Doctrine of Creation," in *No Heaven without Earth*. Edited by J. B. Metz and E. Schillebeeckx, pp. 43-53. London: Concilium - SCM Press.
- Geering, L. 1994. *Tomorrow's God*. Wellington: Bridget Williams Books.
- George, S. 1988. *A Fate Worse than Debt*. Harmondsworth, Middlesex: Penguin.
- Gerle, E. 1995. In search of a global ethics: theological, political and feminist perspectives based on a critical analysis of JPIC and WOMP. *Lund Studies in Ethics and Theology* 2:1-273.
- Gibb, J. A., and J. M. Williams. 1994. "The rabbit in New Zealand," in *The European Rabbit: the History and Biology of a Successful Coloniser*. Edited by H. V. Thompson and C. M. King, pp. 158-204. Oxford: Oxford University Press.
- Goodenough, O. R., and R. Dawkins. 1994. The "St Jude" mind virus. *Nature* 371:23-4.
- Gosling, D. 1992. *A New Earth: Covenanting for Justice, Peace and the Integrity of Creation*. London: Council of Churches for Britain and Ireland (CCBI).
- Gould, S. J. 1977. *Ever Since Darwin*. New York: WW Norton.
- Gould, S. J. 1983a. "Hen's Teeth and Horse's Toes," in *Hen's Teeth and Horse's Toes*. Edited by S. J. Gould, pp. 177-186. New York: WW Norton.
- Gould, S. J. 1983b. "Nonmoral Nature," in *Hen's Teeth and Horse's Toes*. Edited by S. J. Gould, pp. 32-45. New York: WW Norton.
- Gould, S. J. 1989. *Wonderful Life: The Burgess Shale and the Nature of History*. New York: WW Norton.
- Gould, S. J. 1993a. "An earful of jaw," in *Eight Little Piggies*. Edited by S. J. Gould, pp. 95-108. London: Penguin.
- Gould, S. J. 1993b. "Eight little piggies," in *Eight Little Piggies*. Edited by S. J. Gould, pp. 63-78. London: Penguin.
- Gould, S. J. 1993c. "Full of hot air," in *Eight Little Piggies*. Edited by S. J. Gould, pp. 109-120. London: Penguin.
- Granberg-Michaelson, W. 1992. *Redeeming the Creation: the Rio Earth Summit - challenge for the churches*. Geneva: WCC Publications.
- Grant, C. 1986. The gregarious metaphor of the selfish gene. *Religious Studies* 27:431-450.
- Grant, C. 1993. The odds against altruism: the sociobiology agenda. *Perspectives on Science and Christian Faith* 45:96-110.
- Grant-Taylor, D., and B. O'Shaughnessy. 1992. *Rotorua Geothermal Field: a review of the field response to closure*. Bay of Plenty Regional Council 7: 1-57.

References

- Grove-White, R., and O. O'Donovan. 1996. "An alternative approach," in *Values, Conflict and the Environment, Avebury Series in Philosophy*. Edited by R. Attfield and K. Dell, pp. 117-133. Aldershot: Avebury Press.
- Gunn, A. 1988. *Intrinsic Value*. Department of Conservation.
- Hall, J. D. 1986. *Imaging God: Dominion as Stewardship*. Grand Rapids: W.B.Eerdmans Publishing Co.
- Hallman, D. G. 1994. "Beyond "North-South" Dialogue," in *Ecotheology: Voices from North and South*. Edited by D. G. Hallman, pp. 3-9. Geneva: WCC Publications.
- Hardin, G. 1968. The Tragedy of the Commons. *Science* 162:1243-1248.
- Hardin, G. 1993. *Living within limits: ecology, economics, and population taboos*. Oxford: Oxford University Press.
- Hardin, G. 1994. The tragedy of the unmanaged commons. *Trends in Evolution and Ecology* 9:199.
- Hardin, G., and J. Baden. Editors. 1977. *Managing the Commons*. San Francisco: Freeman Books.
- Hartley, P. 1997. *Conservation Strategies for New Zealand*. Wellington: New Zealand Business Roundtable.
- Hawken, P. 1993. *The Ecology of Commerce: a declaration of sustainability*. New York: Harpercollins.
- Hay, R. 1996. "Biodiversity Research: the international conservation context," in *Biodiversity. Papers from a seminar series on biodiversity, 14 June to 26 July 1994*. Edited by B. McFadgen and P. Simpson, pp. 167-70. Wellington: Department of Conservation.
- Hefner, P. 1993. *The Human Factor: Evolution, Culture and Religion*. Minneapolis: Fortress Press.
- Heinen, J. T., and R. S. Low. 1992. Human behavioural ecology and environmental conservation. *Environmental Conservation* 19:105-116.
- Hick, J. 1977. *Evil and the God of Love*. San Francisco: HarperCollins.
- Holloway, J. S. 1993. Conservation pests: how can national values and objectives be quantified? *New Zealand Journal of Zoology* 20:285-293.
- Honderich, T. Editor. 1995. *The Oxford Companion to Philosophy*. Oxford: Oxford University Press.
- Houghton, J. 1997. Christians and the Environment: our opportunities and responsibilities. *Science and Christian Belief* 9:101-111.
- Hughey, K. F. D., and J. P. Parkes. 1996. Thar management - planning and consultation under the Wild Animal Control Act. *Royal Society of New Zealand, Miscellaneous Series* 31:85-90.

References

- Hutchinson, G. E. 1965. *The ecological theatre and the evolutionary play*. New Haven, Conn.: Yale University Press.
- Irons, W. 1996. "Morality, religion and human evolution," in *Religion and Science: History, Method, Dialogue*. Edited by W. M. Richardson and W. J. Wildman, pp. 375-399. New York: Routledge.
- Irons, W. 1997. "Cultural and biological success," in *Human Nature: a critical reader*. Edited by L. Beitzig, pp. 36-49. Oxford: Oxford University Press.
- Itty, J. 1996. Crisis: the international debt. *Anglican World* Michealmas 1996:17.
- Jacobs, M. 1996. *The Politics of the Real World*. London: Earthscan Publications Ltd.
- James, B. 1990. "Pakeha perspectives on the relationships between humans and the natural environment," in *Ecological Restoration of New Zealand Islands*. Edited by D. R. Towns, C. H. Daugherty, and I. A. E. Atkinson, pp. 261-271. Wellington: Department of Conservation: Conservation Sciences Publication No 2.
- Jarvis, B. D. W. 1999. *Rabbit Control, RCD: Dilemmas and Implications*. Royal Society of New Zealand Miscellaneous Series 55.
- John Paul II. 1996. Message to the Pontifical Academy of Sciences. *Quarterly Review of Biology* 72:381-383.
- Jolly, S. 1993. Biological control of possums. *New Zealand Journal of Zoology* 20:335-339.
- Jones, S. 1996. *In the Blood*. London: HarperCollins.
- Kaiser, C. 1991. *Creation and the History of Science*. Grand Rapids, Michigan: WB Eerdmans.
- Kaiser, C. B. 1993. The creationist tradition in the history of science. *Perspectives on Science and Christian Faith* 45:80-89.
- Kaiser, C. B. 1996. The integrity of creation and the social nature of God. *Scottish Journal of Theology* 49:261-290.
- Kee, A. 1982. *Constantine versus Christ: the Triumph of Ideology*. London: SCM Press.
- Kelsey, J. 1997. *The New Zealand Experiment: a world model for structural adjustment?* Auckland: Auckland University Press.
- Keohane, R., and E. Ostrom. Editors. 1995. *Local Commons and Global Interdependence: Heterogeneity and Cooperation in two Domains*. London: Sage Publications.
- King, C. M. 1984. *Immigrant Killers: Introduced Predators and the Conservation of Birds in New Zealand*. Auckland: Oxford University Press.
- King, C. M. 1989. *The Natural History of Weasels and Stoats*. London: Christopher Helm.

References

- King, C. M. 1990. *The Handbook of New Zealand Mammals*. Auckland: Oxford University Press.
- King, C. M. 1996. "Changing values and conflicting cultural attitudes towards plants and animals in New Zealand," in *Biodiversity. Papers from a seminar series on biodiversity, hosted by Science and Research Division, Dept of Conservation, Wellington, 14 June-26 July 1994*. Edited by B. McFadgen and P. Simpson, pp. 69-88. Wellington, New Zealand: Department of Conservation.
- King, C. M. 1997. Is Theology Useful? *Science and Spirit* 8:6-7.
- Korfhage, D. 1990. Debt-for-nature swaps: economic benefit and environmental soundness. *Harvard International Review* 12:45-49.
- Kuhn, T. 1970. *The Structure of Scientific Revolutions*, Second edition. Chicago: University of Chicago Press.
- Kung, H. 1989. "Paradigm change in theology: a proposal for discussion," in *Paradigm change in theology*. Edited by H. Kung and D. Tracey, pp. 3-33. Edinburgh: T&T Clark Ltd.
- Kung, H. 1990. *Global Responsibility: In search of a new world ethic*. London: SCM Press.
- Larson, E. J., and L. Witham. 1997. Scientists are still keeping the faith. *Nature* 386:435-436.
- Lawton, J. H. 1994. What will you give up? *Oikos* 71:353-354.
- Lawton, J. H. 1997. The science and non-science of conservation biology. *Oikos* 79:3-5.
- Leakey, R., and R. Lewin. 1996. *The Sixth Extinction: Biodiversity and its Survival*. London: Weidenfeld and Nicolson.
- Leopold, A. 1949. *A Sand County Almanac*, Special Commemorative Edition (1987) edition. New York: Oxford University Press.
- Lewis, C. S. 1942. *The Screwtape Letters*. London: Geoffrey Bles.
- Lewis, C. S. 1943. *Out of the Silent Planet*. London: Pan.
- Lewis, C. S. 1971. "Man or Rabbit?," in *Undeceptions: Essays on Theology and Ethics*. London: Geoffrey Bles.
- Lewis, C. S. 1977. *The Pilgrim's Regress*. London: Collins.
- Lewontin, R. C. 1991. *The Doctrine of DNA: Biology as Ideology*. London: Penguin.
- Limouris, G. Editor. 1990. *Justice, Peace and the Integrity of Creation: Insights from Orthodoxy*. Geneva: WCC Publications.
- Lindberg, D. C. 1992. *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious and Institutional Context, 600 BC to AD 1450*. Chicago: University of Chicago Press.

References

- Lohse, B. 1985. *A Short History of Christian Doctrine*. Philadelphia: Fortress Press.
- Lucas, J. R. 1979. Wilberforce and Huxley: a legendary encounter. *The Historical Journal* 22:313-330.
- Macdonald, D. W. 1983. The ecology of carnivore social behaviour. *Nature* 301:379-384.
- Martin, D. 1997. *Does Christianity cause war?* Oxford: Clarendon Press.
- Maynard Smith, J., and E. Szathmary. 1995. *The Major Transitions in Evolution*. Oxford: W.H.Freeman.
- McCay, B. M., and J. M. Acheson. Editors. 1987. *The Question of the Commons: the culture and ecology of communal resources*. Tucson: University of Arizona Press.
- McDaniel, J. B. 1989. *Of God and Pelicans: a theology of reverence for life*. Louisville, Kentucky: Westminster/John Knox Press.
- McDaniel, J. B. 1995. *With Roots and Wings: Christianity in an age of ecology and dialogue*. Maryknoll, New York: Orbis Books.
- McDonagh, S. 1990. *The Greening of the Church*. London: Geoffrey Chapman.
- McDonagh, S. 1994. *Passion for the Earth: the Christian vocation to promote justice, peace and the integrity of creation*. London: Geoffrey Chapman.
- McFague, S. 1987. *Models of God: Theology for an Ecological, Nuclear Age*. Philadelphia: Fortress Press.
- McFague, S. 1993. *The Body of God: an ecological theology*. London: SCM Press.
- McGrath, A. 1993. *The Renewal of Anglicanism*. London: SPCK.
- McGrath, A. E. 1994. *Christian Theology: An Introduction*. Oxford: Blackwell.
- McGrath, A. E. 1998. *The Foundations of Dialogue in Science and Religion*. Malden, Mass.: Blackwell Publishers Inc.
- McManners, J. 1992. *The Oxford Illustrated History of Christianity*. Oxford: Oxford University Press.
- Mesle, C. R. 1993. *Process Theology: A Basic Introduction*. St Louis, Missouri: Chalice Press.
- Michaelson, W. G.-I. . 1994. "Creation in ecumenical theology," in *Ecotheology: voices from North and South*. Edited by D. G. Hallman, pp. 96-106. Geneva: WCC Publications.
- Midgley, M. 1978. *Beast and Man: The Roots of Human Nature*. London: Methuen University Paperback.
- Midgley, M. 1979. Gene-juggling. *Philosophy* 54:439-458.
- Midgley, M. 1985. *Evolution as a Religion*. London: Methuen.
- Midgley, M. 1994. *The Ethical Primate: Humans, Freedom and Morality*. London: Routledge.

References

- Miskotte, H. H. 1997. *God's Own Green Paradise: New Zealand Churches and the Environment*. Maastricht, Netherlands: Shaker Publishing.
- Moltmann, J. 1985. *God in Creation*. London: SCM Press.
- Montefiore, H. 1975. *Man and Nature*. London: Collins.
- Moore, N. W. 1987. *The Bird of Time: the science and politics of nature conservation*. Cambridge: Cambridge University Press.
- Morton, J. 1989. *Christ, Creation and the Environment*. Auckland: Anglican Communications, for the General Synod of the Church of the Province of New Zealand.
- Murphy, N. 1990. *Theology in the Age of Scientific Reasoning*. Ithaca, New York: Cornell University Press.
- Murphy, N., and G. F. R. Ellis. 1996. *On the Moral Nature of the Universe: theology, cosmology, and ethics*. Minneapolis: Fortress Press.
- Newbigin, L. 1986. *Foolishness to the Greeks: the Gospel and Modern Culture*. Grand Rapids, Michigan: W.B.Eerdmans Publishing Co.
- Nicholson-Lord, D. 1998. Right returns. *BBC Wildlife* 16:73-74.
- Niles, D. P. Editor. 1992. *Between the Flood and the Rainbow: Interpreting the Conciliar Process of Mutual Commitment (Covenant) to Justice, Peace and the Integrity of Creation*. Geneva: WCC Publications.
- Niles, P. 1989. *Resisting the Threats to Life: Covenanting for Justice, Peace and the Integrity of Creation*. Geneva: Risk Books, World Council of Churches.
- Northcott, M. S. 1994. Is there a green Christian ethic? *Studies in Christian Ethics* 7:32-51.
- Norton, B. G. 1989. "The cultural approach to conservation biology," in *Conservation for the Twenty-first Century*. Edited by D. Western and M. Pearl, pp. 241-246. New York: Oxford University Press.
- Oelschlaeger, M. 1994. *Caring for Creation: an Ecumenical Approach to the Environmental Crisis*. Newhaven Conn: Yale University Press.
- Oestreicher, P. 1986. *The Double Cross. Christianity in a world that's dying to live*. London: Dartman, Longman and Todd.
- Ormerod, P. 1994. *The Death of Economics*. London: faber and faber.
- Oye, K. A., and J. H. Maxwell. 1995. "Self interest and environmental management," in *Local Commons and Global Interdependence: heterogeneity and cooperation in two domains*. Edited by R. O. Keohane and E. Ostrom, pp. 191-221. London: Sage Publications.
- Page, R. 1996. *God and the Web of Creation*. London: SCM Press.
- Pagels, E. 1988. *Adam, Eve and the Serpent*. London: Penguin.
- Palmer, G. 1990. *Environmental Politics*. Dunedin: John McIndoe.

References

- Palmer, G. 1995. *Environment: The International Challenge*. Wellington: Victoria University Press.
- Parkes, J. 1994. *Management of Pests of Conservation Values in New Zealand*. Manaki Whenua Landcare Research Contract report LC 9394/73.
- Passmore, J. 1980. *Man's Responsibility for Nature*, Second edition. London: Duckworth.
- Peacocke, A. 1979. *Creation and the world of science*. Oxford: Clarendon Press.
- Peacocke, A. 1993. *Theology for a Scientific Age*, Enlarged edition. London: SCM Press.
- Peacocke, A. 1995. The challenge of science to the thinking church. *Modern Believing* 36:15-26.
- Peacocke, A., and P. Hodgson. 1996. "The Judaeo-Christian Tradition," in *Values, Conflict and the Environment*, Second edition, *Avebury Series in Philosophy*. Edited by R. Attfield and K. Dell, pp. 141-146. Aldershot: Avebury Press.
- Peacocke, A. R. 1996. "Welcoming the "disguised friend" - a positive theological appraisal of biological evolution." *Vatican Observatory/CTNS conference (in press), Rome, 1996*.
- Pepper, D. 1984. *The Roots of Modern Environmentalism*. London: Croom Helm/Academic Press.
- Poole, M. 1994. A critique of aspects of the philosophy and theology of Richard Dawkins. *Science and Christian Belief* 6:41-59.
- Pratt, D. Editor. 1987. *Signposts: Theological Reflections in a New Zealand Context*. Auckland: College Communications (St John's College).
- Primavesi, A. 1991. *From Apocalypse to Genesis*. Tunbridge Wells, Kent: Burns and Oates.
- Quammen, D. 1996. *The Song of the Dodo: Island biogeography in an age of extinctions*. London: Hutchinson.
- Rainbow, S. 1993. *Green Politics*. Auckland: Oxford University Press.
- Rajotte, F. 1987. "The silence of the churches on the environmental crisis," in *Report and background papers for the meeting of the Church and Society Working Group, Glion, Switzerland, September 1987*. Edited by Anon., pp. 183-193. Geneva: World Council of Churches.
- Rasmussen, L. 1996. *Earth Community, Earth Ethics*. Geneva: WCC Publications.
- Resor, J. P. 1997. Debt-for-nature swaps: a decade of experience and new directions for the future. *Unasylva* 48:15-22.
- Reynolds, V., and R. Tanner. 1995. *The Social Ecology of Religion*. Oxford: Oxford University Press.

References

- Richards, D. 1991. "Post-communal land ownership: poverty and political philosophy," in *Commons Without Tragedy: Protecting the Environment from Overpopulation - a new approach*. Edited by R. V. Andelson, pp. 83-108. London: Shephard-Walwyn.
- Ridley, M. 1993. *The Red Queen: Sex and the Evolution of Human Nature*. London: Penguin.
- Ridley, M. 1996. *The Origins of Virtue*. London: Viking Press.
- Rolston III, H. 1992. Disvalues in nature. *The Monist* 75:250-278.
- Rolston III, H. 1994. Does nature need to be redeemed? *Zygon* 29:219-229.
- Rudge, M. R. 1990. "The importance of feral animals on New Zealand islands," in *Ecological Restoration of New Zealand Islands*. Edited by D. R. Towns, C. H. Daugherty, and I. A. E. Atkinson, pp. 217-220. Wellington: Department of Conservation: Conservation Sciences Publication No 2.
- Rue, L. 1998. Sociobiology and moral discourse. *Zygon* 33:525-533.
- Rue, L. D. 1989. *Amythia: Crisis in the Natural History of Western Culture*. Tuscaloosa, Alabama: University of Alabama Press.
- Rue, L. D. 1994. *By the Grace of Guile: The Role of Deception in Natural History and Human Affairs*. New York: Oxford University Press.
- Runciman, W. G., J. Maynard Smith, and R. I. M. Dunbar. Editors. 1996. *Evolution of social behaviour patterns in primates and man*. Oxford: Oxford University Press, for The British Academy.
- Runnels, C. N. 1995. Environmental degradation in Ancient Greece. *Scientific American* 272:72-75.
- Ruse, M. 1986. *Taking Darwin Seriously: A Naturalistic Approach to Philosophy*. Oxford: Basil Blackwell.
- Sagan, C. 1977. *The Dragons of Eden: Speculations of the Evolution of Human Intelligence*. New York: Ballantine Books.
- Santmire, P. 1985. *The Travail of Nature: the ambiguous ecological promise of Christian theology*. Minneapolis: Fortress Press.
- Schmitz-Moormann, K. 1995. The future of Teilhardian theology. *Zygon* 30:117-129.
- Seymour, J., and H. Girardet. 1990. *Far from Paradise: the story of human impact on the environment*. London: Greenprint/ BBC Enterprises.
- Sheehan, T. 1988. *The First Coming: How the Kingdom of God became Christianity*. New York: Vintage Books (Random House).
- Shinn, R. L. 1972. "Science and ethical decision: some new issues," in *Earth Might Be Fair: Reflections on ethics, religion and ecology*. Edited by I. G. Barbour, pp. 123-145. Englewood Cliffs, NJ: Prentice-Hall Inc.

References

- Simkins, R. A. 1994. *Creator and Creation: Nature in the Worldview of Ancient Israel*. Peabody, Mass. USA: Hendrickson Publishers Inc.
- Singer, P. 1983. *The Expanding Circle: ethics and sociobiology*. Oxford: Oxford University Press.
- Smith, A. 1776. *An Enquiry into the Nature and Causes of the Wealth of Nations*. New York: Modern Library (1937 reprint).
- Spretnak, C. 1986. *The Spiritual Dimension of Green Politics*. Santa Fe, New Mexico: Bear & Co.
- Stauffer, R. C. 1975. *Charles Darwin's Natural Selection*. Cambridge: Cambridge University Press.
- Stevenson, G. G. 1991. *Common Property Economics: a general theory and land use applications*. Cambridge: Cambridge University Press.
- Swadling, H. 1989. "The practical implications of the ecological crisis," in *Repainting the Rainbow: ecology and Christian living*. Edited by R. Galvin and R. Kearns, pp. 26-34. Auckland: Christian Ecology Group and Maclaurin Chaplaincy, University of Auckland.
- Swimme, B., and T. Berry. 1990. *The Universe Story*. San Francisco: HarperSanFrancisco.
- Sylvan, R. 1992. "On the value core of deep-green theory," in *Justice, Ethics and New Zealand Society*. Edited by G. Oddie and R. W. Perrett, pp. 222-229. Auckland: Oxford University Press.
- Taylor, R., and I. Smith. 1997. *The State of New Zealand's Environment*. Wellington: Ministry for the Environment.
- Theissen, G. 1984. *Biblical Faith: An Evolutionary Approach*, English edition (tr John Bowden). London: SCM Press.
- Thomas, K. 1983. *Man and the Natural World*. Harmondsworth: Penguin Books.
- Thomson, D. 1991. *Selfish Generations? The Ageing of New Zealand's Welfare State*. Wellington: Bridget Williams Books.
- UNEP. 1992. *Caring for the Earth: A learner's guide to sustainable living*. United Nations Environment programme.
- van Klinken, J. 1991. "'The integrity of creation': the third point of the JPIC process. Ecology between theology and science," in *No Heaven without Earth*. Edited by J. B. Metz and E. Schillebeeckx, pp. 65-78. London: Concilium - SCM Press.
- van Till, H. J. 1996. Basil, Augustine, and the Doctrine of Creation's Functional Integrity. *Science and Christian Belief* 8:21-38.

- Vaney, N. 1993. Two visions of right relationship between humankind and the rest of creation: A comparison and critique of the theologies of Hans Küng and Jürgen Moltmann. PhD thesis, University of Otago.
- Vink, N., and W. E. Kassier. 1987. The "tragedy of the commons" and livestock farming in southern Africa. *South African Journal of Economics* 55:165-182.
- Vitousek, P., H. A. Mooney, J. Lubchenco, and J. M. Melillo. 1997. Human domination of Earth's ecosystems. *Science* 277:494-499.
- Wade, R. 1987. The management of common-property resources: collective action as an alternative to privatisation or state regulation. *Cambridge Journal of Economics* 11:95-106.
- Walsh, B. J. 1987. Theology of hope and the doctrine of creation: an appraisal of Jürgen Moltman. *Evangelical Quarterly* 59:53-75.
- Ward, K. 1992. *Defending the Soul*. Oxford: Oneworld (Hodder and Stoughton).
- Ward, K. 1996. *God, Chance and Necessity*. Oxford: Oneworld.
- Webster, A. C., and P. E. Perry. 1989. *The Religious Factor in New Zealand Society*. Palmerston North: Alpha Publications, for The New Zealand Study of Values, Massey University.
- White, L. 1967. The historic roots of our ecologic crisis. *Science* 155:1204-1207.
- Whitehead, A. N. 1927. *Science and the Modern World*. Cambridge: Cambridge University Press.
- Whiten, A., and R. W. Byrne. Editors. 1997. *Machiavellian Intelligence II: extensions and evaluations*. Cambridge: Cambridge University Press.
- Wilkinson, L. 1993. Christianity and the Environment: Reflections on Rio and Au Sable. *Science and Christian Belief* 5:139-145.
- Willey, K. 1979. *When the Sky Fell Down: The Destruction of the Tribes of the Sydney Region, 1788-1850s*. Sydney: Collins.
- Williams, G. C. 1966. *Adaptation and natural selection. A critique of some current evolutionary thought*. Princeton: Princeton University Press.
- Williams, G. C. 1992. *Natural Selection: Domains, Levels and Challenges*. New York: Oxford University Press.
- Williams, G. C. 1996. *Plan and Purpose in Nature*. London: Weidenfeld & Nicolson.
- Williams, J. M. 1993. Effects of public perceptions and global market strategy on the development of biological control technology in New Zealand. *New Zealand Journal of Zoology* 20:347-356.
- Williams, P. A. 1998. Evolution, Sociobiology and the Atonement. *Zygon* 33:557-570.
- Williamson, R. 1992. "'What God has joined together, let no one put asunder': Reflections on JPIC at the Canberra Assembly," in *Between the Flood and the Rainbow: Interpreting the Conciliar Process of Mutual Commitment*

References

- (Covenant) to Justice, Peace and the Integrity of Creation. Edited by D. Niles, pp. 82-101. Geneva: WCC Publications.
- Wilson, D. 1992a. On the relationship between evolutionary and psychological definitions of altruism and selfishness. *Biology and Philosophy* 7:61-68.
- Wilson, D. 1997a. Altruism and organism: disentangling the themes of multi-level selection theory. *American Naturalist* 150, Supplement:S122-S134.
- Wilson, D. 1997b. Introduction: multi-level selection theory comes of age. *American Naturalist* 150 Supplement:S1-S4.
- Wilson, D., and E. Sober. 1994. Reintroducing group selection to the human behavioural sciences. *Behavioural and Brain Sciences* 17:585-654.
- Wilson, E. O. 1975. *Sociobiology: the new synthesis*. Cambridge, Mass.: Harvard University Press.
- Wilson, E. O. 1977. *On Human Nature*. Cambridge, Mass: Harvard University Press.
- Wilson, E. O. 1992b. *The Diversity of Life*. Cambridge Mass.: Belknap Press, Harvard.
- Wilson, E. O. 1998. *Consilience: The unity of knowledge*. London: Little, Brown Co.
- Wilson, R. 1982. *From Manapouri to Aramoana: the battle for New Zealand's environment*. Auckland: Earthworks Press.
- Wolpert, L. 1992. *The Unnatural Nature of Science*: faber and faber.
- Wrangham, R., and D. Peterson. 1996. *Demonic Males: Apes and the origin of human violence*. London: Bloomsbury.
- Wright, L. W. 1980. Decision making and the logging industry:an example from New Zealand. *Biological Conservation* 18:101-115.
- Wright, R. 1994. *The Moral Animal*. New York: Random House.
- Wyman, R. L., D. W. Steadman, M. E. Sullivan, and M. F. Walters-Wyman. 1991. "Now what do we do?," in *Global Climate Change and Life on Earth*. Edited by R. L. Wyman, pp. 252-263. New York: Routledge, Chapman & Hall.
- Young, F. 1991. *The Making of the Creeds*. London: SCM Press.
- Zacks, R. 1997. What are they thinking? Student's reasons for rejecting evolution go beyond the Bible. *Scientific American* 277:34.